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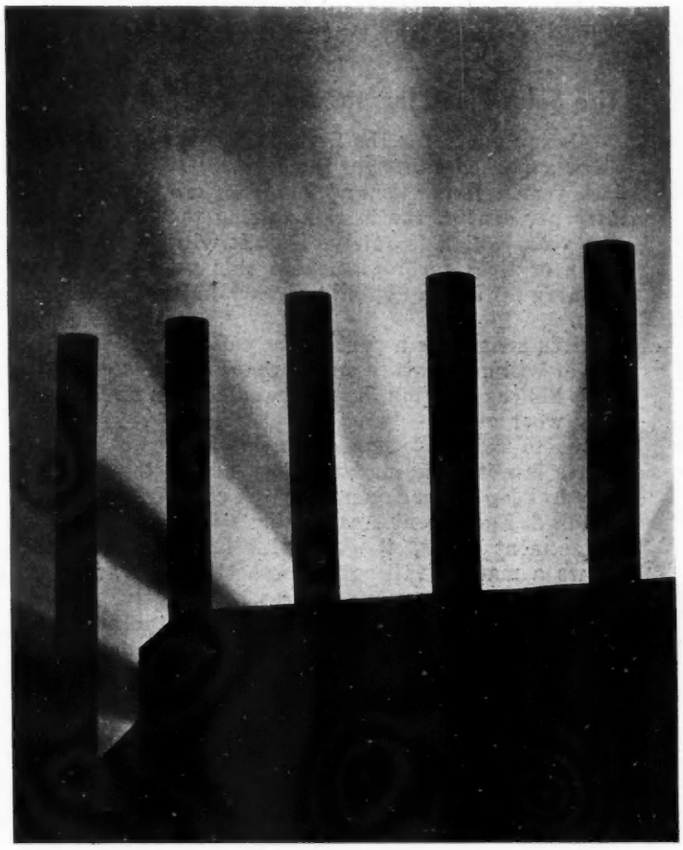


Owners are spending less to keep their cars in good condition than ever before and at the same time are driving more miles + + +

by A. B. Crofoot

Eighteen Months of Delayed Buying Will Force Early Activities in Dormant Plants

AUTOMOBILE owners are *wearing out* their cars faster this year than in the past. When we say wearing out, we mean not only putting them to more use, but spending less to keep them in good condition than in previous years. This means, of course, that they are but hastening the day when they will either have to do without their cars, or begin replacing them on a large scale. In other words, there is at present under construction an ever-increasing backlog of delayed purchasing, which when released should accelerate buying.

Evidence that people are using their cars this year should not be necessary for anyone who attempts to negotiate holiday and weekend traffic to any of our playgrounds. Evidence can be found, however, in the first column of Table I shown with this article. There were nearly five billion gallons of gasoline consumed during the first five months of this year —more than 150 million gallons in excess of the consumption during the corresponding period of last year.

The first five months, of course, do not include the

vacation months, when the consumption is normally the heaviest. Whether vacations this year will witness a smaller consumption of gasoline than normal, it is of course as yet too early to tell. However, it will be noted that the consumption of the first five months of last year was only about 30 per cent of that for the whole year. Furthermore, the figures for this year and those for the first five months of last year are for gasoline on which tax was paid, as prepared by the American Petroleum Institute, and represent almost entirely gasoline used for motor vehicles, while the yearly figures quoted are prepared by the United States Bureau of Mines, and represent all gasoline consumption for any purpose whatever. It is therefore evident that the figures for this year loom still larger when compared with figures for road use in previous years.

The contention that the increased gasoline consumption this year might be due to the increasing number of eight-cylinder cars would hardly support an increase of a hundred and fifty million gallons in five months time. Furthermore it must be borne in mind that the bulk of the new cars sold this year have been Ford and Chevrolet and that Chevrolet has been building a six-cylinder car since before the depression, so that there has not been a sufficient increase in the registration of multi-cylinder cars to account for this growth in gasoline consumption.

Further evidence that people are using their old cars this year is supplied by the figures on tire replacement sales, the third column in this table. These figures are based on shipment figures prepared by the Rubber Manufacturers Association, together with figures published by the rubber division of the United States Department of Commerce. While the Rubber Association's actual figures on replacement sales as compared with original equipment sales are for the confidential use of their members, and hence are not given out, the association does publish total shipment figures from month to month. By comparing these with car production figures, it is comparatively a simple matter to obtain a figure for original equpment, and by subtraction to obtain a figure for replacement sales that is fairly near accurate.

Tire Sales Have Increased

These figures for the first six months of this year show a marked gain over the corresponding period of last year. Here, too, allowing for an approximate fifty per cent of the market during the first half of the year, which is fairly close, it will be seen that sales of tires for replacement this year have been running far ahead not only of 1930, but ahead of 1929 also.

Tires constitute a part of the car without which a driver will not venture on the road. If he is going to keep his car running, he must replace his tires when they wear out.

But to return to our original statement: the car owner is not spending any more money than necessary to keep his car operating. A comparison of the Motor & Equipment Association's index figures for replacement parts, the second column in Table I, shows a marked falling off both this year and last from the previous year's figures. Evidently, as long as the engine will run and pull the car, the owner is putting nothing into it outside of gasoline and oil.

This is not universally true, as some of the larger

Table I

Tire Replacements and Gasoline Consumption Compared With Replacement Parts Show Fewer Repairs —More Mileage.

Year	Gasoline Consumption Annual	M.E.A. Index Replacement Parts (6 mo.)	Tire Replacements Annual
1925	9,402,330,000	108	40,000,000
1926	10,996,146,000	136	40,000,000
1927	12,465,894,000	116	47,800,000
1928	13,810,994,000	147	53,500,000
1929	15,791,956,000	153	47,000,000
1930	16,613,520,000	137	38,400,000
1930 (5 mo.)	4,838,117,000	. . .	(6 mo.) 17,500,000
1931 (5 mo.)	4,990,303,000	114	(6 mo.) 20,000,000

Table II

Percentage Difference M. E. A. Index Figures

Year to Year

Year	Original Equipment	Replacement Parts	Accessories	Service Equipment
1925-26	+ 4.4	+25.4	+ 4.3	+15.5
1926-27	+14.4	−14.7	−21.3	+ 6.4
1927-28	+17.5	+27.1	−15.7	−14.3
1928-29	+26.3	+ 5.1	−17.6	+28.4
1929-30	−41.7	−10.08	−13.7	−22.2
1930-31	−31.7	−17.15	−19.05	−31.1

piston ring manufacturers show the best business they have had in several years during the first six months of this year. When analyzed, however, this fact would tend to lend weight to the earlier contention. In other words, where an engine has become too obviously in need of attention, it has received such attention as was necessary to keep it running, but insofar as possible the owner has avoided major overhauls. By fitting in new rings, he has avoided a reboring job and the purchase of new pistons. There has been no other single group of replacement parts manufacturers that has shown the same trend this year as have the makers of piston rings.

Service Equipment Sales Less

If further evidence were needed that car owners are not servicing their cars this year as heavily as they have in past, a comparison of the columns in Table II would supply it. The fourth column, for example, which shows the percentage difference between the M.E.A. index for service equipment from year to year, shows that service stations have purchased over 30 per cent less equipment this year than they did during the corresponding six months last year. As would be expected, the same is true of sales of parts for original equipment. New car production being, as it is, so much lower than last year, it is inevitable that sales of the parts used for this production should also be lower.

It is noteworthy, however, that with both the original equipment and service equipment over 30 per cent lower this year, the drop in replacement parts and accessories has been less than 20 per cent. The same thing is true if the figures are analyzed month by month and compared with figures for the corresponding months of last year. It appears evident, then, that owners are spending what is absolutely necessary to keep their cars running, but in spite of more use are spending considerably less than they did last year or the year before.

Furthermore, comparison shows that this condition is not new this year. Everything that has been said about this year in comparison with last also holds true with regard to last year in comparison with 1929. In other words, this state of affairs has now been in existence for over a year and a half. Gasoline consumption in 1930 was higher than in 1929, showing wider use of motor vehicles, and the M.E.A. index for replacement parts was lower. Apparently the sale of tires for replacement was lower, but drivers were evidently making their old tires last as long as possible too. These they have now had to replace, and sooner or later they will have to replace their cars for the same reasons.

Doubtless the time will come when many of these car owners will attempt more far-reaching repairs on their cars, and this should result in an increase in the sale of replacement parts. However, by that time many of the car will be so completely worn out that they will have to be entirely replaced. The present condition, therefore, holds promise of hope, not only to the car manufacturer, but to the replacement parts manufacturer as well.

Car Life Has Increased

The National Automobile Chamber of Commerce, in its chart showing the comparison of new car registrations with cars scrapped, showed an increase last year in the average life of a car from six and three-quarters years to seven years, which condition was prevailing back in 1923. More old cars are being run now, comparatively speaking, than for some time past, and eventually many of these will follow the course of the "one hoss shay." When that time comes, the car manufacturer can expect markedly increased sales. It is entirely possible that for a while the "normal replacement market of three and a half million cars" will be exceeded. And this time cannot be very far off at the rate cars are being worn out today.

Specific Output of Passenger Car

Improved combustion chamber design, lighter reciprocating parts, stiffer crankshafts and crankcases contributed most to gain in horsepower per cubic inch

ACCORDING to a table of averaged or derived engine data published in *Automotive Industries* of June 13 last, the average horsepower per cubic inch of engine displacement for all American passenger cars increased from 0.224 in 1926 to 0.326 in 1931. This is an increase of 45 per cent in five years —a rather remarkable figure—and the question naturally arises as to how this gain was brought about.

"Horsepower per cubic inch" is made up of two factors, namely, brake mean effective pressure and revolutions per minute. Suppose, for instance, that a certain engine develops a brake mean effective pressure of 72 lb. p. sq. in.—a representative value. Then the work done in the engine per cubic inch displacement during a single cycle is 72 in.-lb. or 6 ft.-lb. If the engine turns at, say, 3300 r.p.m. there will be 1650 cycles in each cylinder per minute, and the work done per cubic inch displacement per minute will be

$$1650 \times 6 = 9900 \text{ ft.-lb.},$$

which makes the horsepower per cubic inch—

$$9900/33{,}000 = 0.3.$$

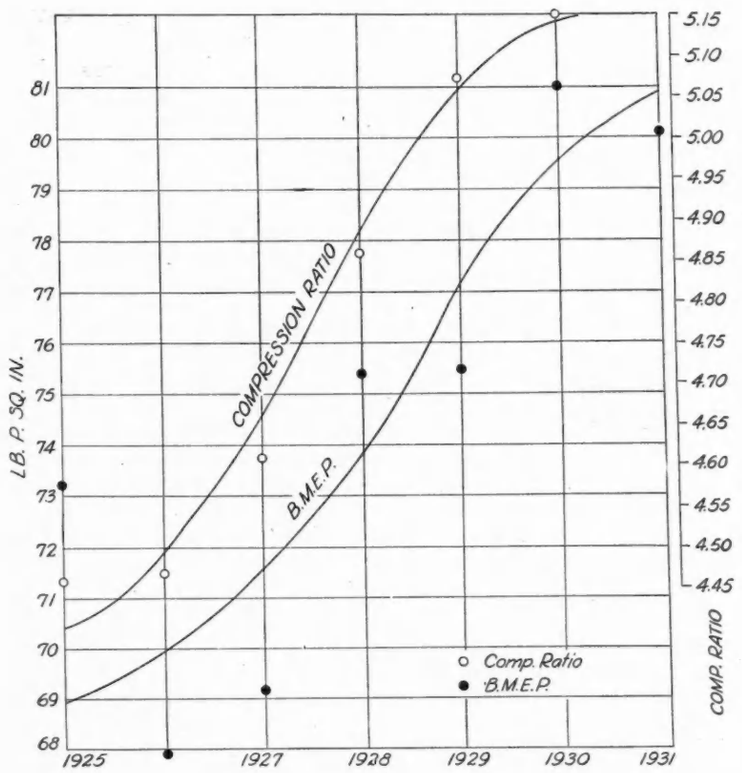


Fig. 1—Chart showing increases in compression ratio and brake mean effective pressure from 1926 to 1931 + + + + + +

The data presented in the issue of June 13 really represent a period of six years, from 1925 to 1931, but it appears that from 1925 to 1926 there was a slight decrease in the specific horsepower of the engines, hence the 1926 and 1931 figures were used for the above comparison. In the following analysis we shall make use of the figures applying to the six-year period.

The average brake mean effective pressure at the speed of rated output increased somewhat erratically from 73.2 lb. p. sq. in. in 1925 to 80.1 lb. p. sq. in. in 1931. As long as the same kind of fuel is used, practically the only way to increase the brake mean effective pressure is by increasing the compression ratio. It might be argued that the b.m.e.p. might be raised also by increasing the volumetric efficiency. However, any change which tends to increase the volumetric efficiency at a given speed, such as an increase in the size of valves, would immediately be taken advantage of to increase the speed of revolution. In fact, this occurs automatically, for if the valve capacity is increased the horsepower will continue to increase up to a higher speed, at which the engine will be rated, so that at the rated speed the volumetric efficiency will be the same again.

The compression ratio has been increased consistently year by year, as may be seen from Table I, in which the average ratios for the different years are given. It may seem strange that during some years the average b.m.e.p. showed a decrease while the average compression ratio increased. An explanation may be found in the fact that not exactly the same engines are represented by the average compression ratios as by the average b.m.e.ps. The figures are based on

Engines Increased 45% in Five Years

by P. M. Heldt

car specifications in the *Automotive Industries* statistical number, and in some cases the compression ratio was given while the horsepower of the engine and the speed at which it was developed (from which the b.m.e.p. is calculated) were lacking, while in other cases the horsepower and speed were given while the compression ratio was lacking. In the great majority of cases, of course, complete data were available for the engines. Moreover, the b.m.e.p. is calculated from the "rated" horsepower, which is naturally a somewhat indefinite factor in connection with which we can hardly expect the same degree of precision as in connection with the compression ratio, for instance.

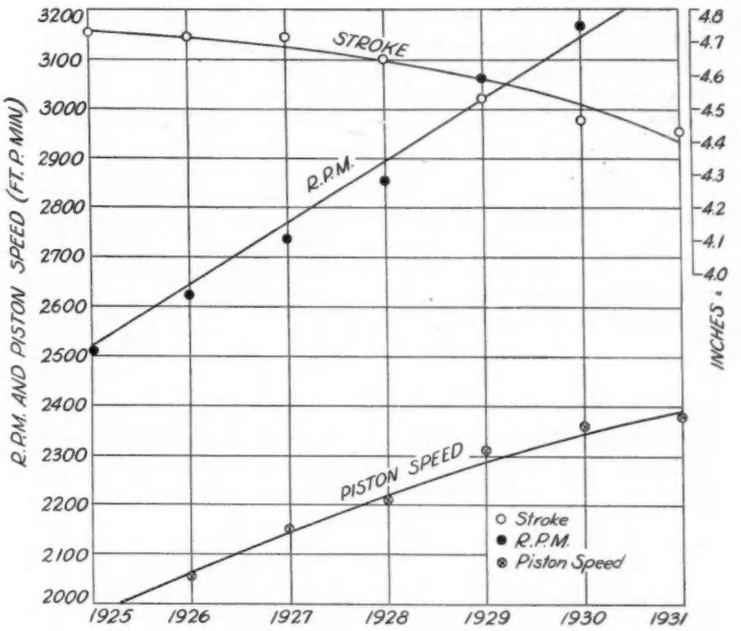


Fig. 3—Chart showing variations in average length of stroke, r.p.m., and piston speed from 1925 to 1931 + + +

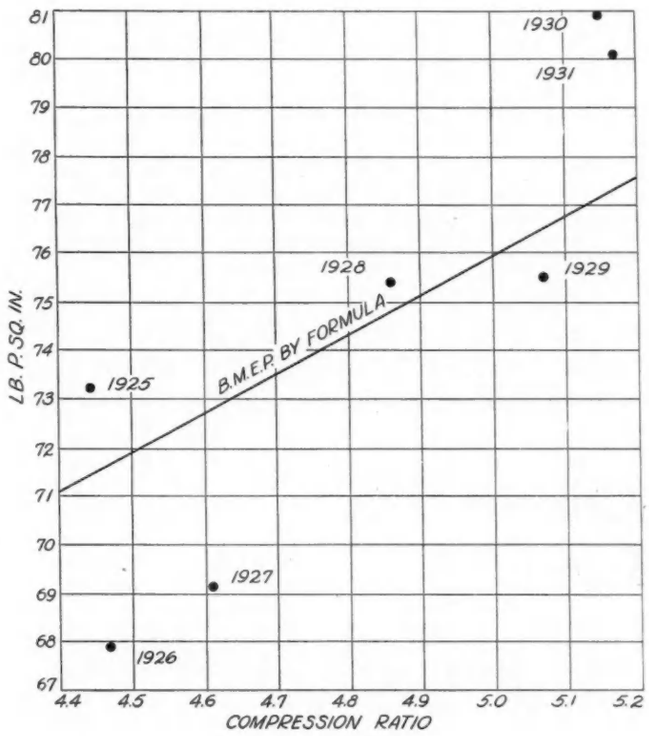


Fig. 2—Chart showing relation between compression ratios and b.m.e.ps. + +

In Fig. 1 the compression ratios and the brake mean effective pressures are plotted, and curves have been drawn in which are intended to represent the general trend of these two factors during the last six years. It might be argued that the changes of average compression ratio and brake mean effective pressure from year to year follow no definite law, hence there is no justification for the smooth curves, but it seems to the writer that these curves give a clearer picture of the trends of these two factors in recent years than would the usual zig-zag lines connecting the points of the plot. The similarity of the two curves is worth noting and is, of course, in full accord with theory, since the mean effective pressure is a direct function of the compression ratio.

In Chart II the average brake mean effective pressures for the different years are plotted against the corresponding compression ratios. The brake mean effective pressure is related to the compression ratio by the equation

$$\text{B.m.e.p.} = C \frac{r^{1.3} - r}{r - 1}$$

where C is a constant and r the compression ratio. Using the data of Table I we find that the average value of C figures out to 98, and the curve in Fig. 2 represents the equation

$$\text{B.m.e.p.} = 98 \frac{r^{1.3} - r}{r - 1} \text{ lb. p. sq. in.}$$

Speed of revolution, piston speed and average length of stroke have varied constantly since 1925. The average values of these three factors for the different years are plotted in Fig. 3. It will be noted first that there has been a slight decrease in the average length of piston stroke, which is the reason the average piston speed has not increased quite as fast proportionally as the revolutions per minute. That lengths of stroke have decreased is due partly to the fact that cylinder numbers have increased and cylinder sizes simultaneously decreased, and partly to the fact that it has become recognized that decreasing the length of the stroke tends to lessen trouble from engine vibration. From 1926 to 1931 the average engine r.p.m. increased from 2612 to 3226, a matter of 23.4 per cent. During the same period the average b.m.e.p. increased from 67.9 to 80.1 lb. p. sq. in., or by 17.8 per cent. The two increases together give the increase of 45 per cent in the specific output, for

$$1.234 \times 1.178 = 1.45 \text{ plus.}$$

If we want to pursue the inquiry further, the next question that arises is how it was possible to increase the compression ratio from an average of 4.46 to an average of 5.17 and the r.p.m. from an average of 2510 to an average of 3226 in six years.

The higher compression ratio was made possible by improvements in features of design, such as the shape of the combustion chamber, the location of the spark plug and the materials used for the parts inclosing the combustion chamber, particularly the piston. The reduction in the average displacement of the individual cylinder which accompanied the increase in cylinder numbers, also has helped toward this end. Combustion chambers have been carefully studied to develop forms less subject to detonation, and the best location of the spark plug from this point of view has been the subject of considerable experimentation. The use of aluminum in the pistons permits of a more rapid flow of heat into the jacket water, which means lower piston head temperatures and consequently lower tendency to detonation. It is possible also that there has been an improvement in the fuels marketed with respect to their anti-detonating characteristics. At any rate, doped anti-knock fuels are now widely distributed, which was not the case in 1925, and this change has had its effect on the compression ratios used. In fact, some of the engines developed after 1925 were designed specially for the use of the high-compression premium-price fuels.

Table I

Year	Compression Ratio r (Average)	Theoretical B.M.E.P.	Actual B.M.E.P (Average)
1925	4.46	71.5	73.2
1926	4.47	71.6	67.9
1927	4.61	72.7	69.15
1928	4.86	74.7	75.4
1929	5.07	76.5	75.5
1930	5.15	77.1	81.0
1931	5.17	77.3	80.1

Table II

Year	R.P.M. (Average)	Stroke (Average)	Piston Speed (Average)
1925	2,510	4.73	1,977
1926	2,612	4.72	2,055
1927	2,738	4.72	2,150
1928	2,856	4.65	2,210
1929	3,062	4.53	2,310
1930	3,168	4.47	2,360
1931	3,226	4.43	2,380

The speed of rotation at which an engine gives its maximum output and at which it is generally rated is dependent on two factors, namely, the valve capacity and the capacity of its bearings to carry loads which are due mainly to the inertia forces on its reciprocating parts. It was shown in the foregoing that the average length of stroke has decreased somewhat during the period here considered. With a shorter stroke it is possible to get a relatively higher valve capacity, since the maximum size the valves can be made depends only on the bore, and when the stroke is reduced the valve-port capacity or valve opening area is greater in proportion to the displacement of the cylinder. A reduction in the length of stroke also reduces the inertia forces at a certain speed of revolution, and therefore permits of increasing the speed of revolution. On the other hand, engines are now so designed that they will take care of higher inertia forces without trouble. Crankshafts are generally made heavier and crankcases are made more rigid by providing cross walls between each pair of adjacent cylinders and by using additional ribs both on the outside walls and on the cross walls or bulkheads. The more extensive use of torsional vibration dampers and of rubber engine mounting may have been other factors permitting the use of high speeds of revolution.

Motor Fuel From Vegetable Oils and Diesel Development in France

AT a conference on the subject of national motor fuels held in connection with the Colonial Exposition in Paris, it was stated that the process for producing motor fuel from vegetable oils, invented by Professors Sabatier and Mahle, when tried out on a large scale, had proved to be uneconomical. The plant erected for the purpose will be maintained, however, for use in case of an emergency. One of the speakers said that in arriving at the conclusion that the process was uneconomical, no account had been taken of the heavy residual oils, which were thought to be useless, but of which it was now known that they could be used in heavy oil engines. M. Dumanois of the National Office for Liquid Fuels said the heavy oil engine industry had made less progress in France than in neighboring countries, owing to the high duty on crude oils imported into France. Owing to the high cost of the fuel, manufacturers are not sure of the economical advantages of the engine and therefore hesitate to spend monev for the development of engines of the heavy-oil type.

JUST AMONG OURSELVES

Among the "Doubting Thomases" Are

"THE Chinese Emperor Shun (2258 B.C.) was the first man in human history actually to fly a self-powered flying machine."

Thus spake this publication on its "Automotive Oddities" page on July 18 last.

Came quickly many letters and postcards from lineal descendents of the fabled Doubting Thomas to cry at the editor, Leslie Peat, "How come?"

And among the criers was N.G.S. himself, he who writeth this page. In reply to these queries, Mr. Peat—who, incidentally, knows his China from years of living there—has written interestingly. Whether he has proved his case to the satisfaction of his doubters we leave you to determine; that you will be intrigued by the history he gives, we'll guarantee. Here's what Mr. Peat says:

Emperor Shun Ends Petty Wars

"IN Chinese history the Emperor Shun holds about the same place as does King Arthur in British history. Having served his predecessor as regent (or more properly as prime minister) for 26 years, Shun ascended the throne of the Son of Heaven with a determination to end the petty wars which had stirred the country from time immemorial.

"One of his first moves was to appoint a certain Yu as minister of public works, probably the first man in all time to hold such a portfolio. With Yu, Emperor Shun designed 'machines of war,' described as catapults not unlike those built by Julius Caesar some 2000 years later.

"These men concocted a liquid fire which they named 'breath of hell' and threw this mixture into the ranks of invaders . . . thus ending pillage and massacres for many years. Ships 'armed with bronze rams and manned by many oarsmen confounded enemy barges' and ended for a long time the perennial scourge of river and coastwise pirates.

"But in his 'administration of the arts of peace and commerce he excelled,' according to Confucius, who ranks as China's most eminent historian.

Regarding That Early Airplane

"IN this work, too, Yu's ingenuity was used. The triangulation method of surveying seems to appear first in the archives of history in connection with 'the laying out, at several levels, of the Whang Ho irrigation and barge canal project,' part of which is still extant.

"Towers were erected in the area to facilitate this survey, and here, on this project, appears the reference to the first airplane in the history of mankind.

"Both Baron Ferdinand von Richthoven, professor of geography at Leipsig and later at the Imperial University at Berlin, and Prof. H. A. Giles, Cambridge University, eminent translator of Chinese literature and author of the standard Chinese-English dictionary, find references to 'a machine Shun caused to be built to lift the Emperor from the earth that he might view the broad areas thus irrigated and connected with canals.

"It seems reasonable to suppose that the venture was unsuccessful since it was not referred to in any other connection as far as translators have been able to discover.

Standard Subject in Arts and Crafts

"BUT it so captivated the imagination of poets, weavers of tapestries, potters and other artisans that the incident has become one of the standard subjects of Chinese illustration. The machine, sometimes shown with a wood frame and sometimes representing a carpet, always shows a wheel with fan blades in the front, propeller-wise.

"Other details, except adornment, do not appear. No other description seems to exist, a fact due to the great burning of books by a later ruler who sought to 'erase the past literature of the nation and to substitute therefor his own writings.'

"When Confucius undertook to write his classic history of Chinese antiquity, the Shu-king, he lamented the fact that many details of earlier historians had been destroyed by this calamitous destruction of records of earlier writers. His work, written nearly 2000 years after the time of Shun, was necessarily somewhat meagre in many respects, although he devotes a great deal of space to this emperor and his exploits, a few of which I've given above."—N.G.S.

Damping Capacity Is An Inverse Sensitiveness of a Material to Surface

Materials having high damping values are able to be stressed to a higher degree than Hooke's law indicates without being permanently deformed

IN engineering work it is generally considered that when elastic materials such as steel are subjected to stresses within the elastic limit, and as a result are stretched, compressed or otherwise deformed, as soon as the stress is removed the material returns to its original shape. In fact, Hooke's law, according to which the strain or deformation is proportional to the stress, is supposed to apply. Only at the so-called proportional limit was this law supposed to become inapplicable. Recent tests made with instruments of great precision have shown, however, that there is a deviation from Hooke's law even at very low stresses. The strain does not increase in exact proportion to the stress, and if the stress is completely removed, some slight amount of strain remains, which can be eliminated only by applying a small reverse stress.

Therefore, if a specimen is subjected to a complete cycle of alternating stress and a plot is made of stress vs. strain, a so-called hysteresis diagram is obtained. Since it is neecessary to apply a small reverse stress to bring back the specimen to its original state after it has been stressed in one direction and the stress has been removed, it is obvious that a loss of energy is involved in thus putting a specimen through a cycle of stress. The loss due to a complete cycle of alternating stress is measured by the area of the hysteresis loop. That there is a loss of this kind when the maximum stress applied is well below the elastic limit is known also from the fact that when specimens are tested in an endurance machine at comparatively low stresses they always attain a temperature well above that of the atmosphere, which can be due only to energy lost in the specimen by internal friction.

The subject is of some interest to automotive engineers because of its influence on the maximum amplitude that may be reached in torsional vibration of crankshafts. There is an inherent damping effect in the case of such vibration even when the amplitude of the vibration is very small, and the effect increases with the amplitude. The damping effect, moreover, depends not only on the maximum stress on the shaft but also on the material of which it is made.

The damping capacity of materials was discussed in a paper by G. S. von Heydekampf presented at the annual meeting of the American Society for Testing Materials at Chicago. This property of matter has been studied by a number of investigators, and O. Foepple has proposed the following definition: "Damping capacity is the amount of work dissipated in heat by a unit volume of the material during a completely reversed cycle of unit stress." Damping capacity therefore can be measured in inch-pounds per cubic inch. In comparing materials having different moduli of elasticity, it is advisable to use the specific damping

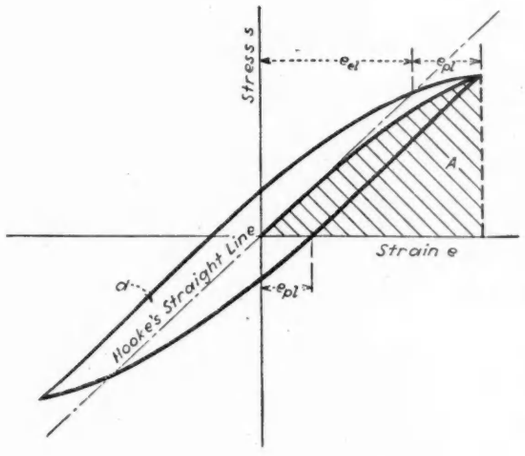


Fig. 1—Hysteresis loop for a cycle of alternating stress + + + +

Measure of the Defects and Offsets

capacity. This is equal to the quotient of the damping capacity by the potential energy stored at the maximum stress of the cycle that is being considered. Since both the damping capacity and the energy stored at maximum stress have the dimensions of energy, it follows that the specific damping capacity is a dimensionless quantity.

It is usual to determine the damping capacity on solid round specimens. The value of the damping capacity or specific damping capacity obtained in this way corresponds to the definition given above if all of the fibers of the cross section are uniformly stressed, as in tension-compression tests. In bending and torsion tests, however, the stress is not uniform over the whole section. In cases of this kind the different fibers contribute unequally to the damping value, which latter is measured as the average. These average damping values can be converted into absolute damping values by computation.

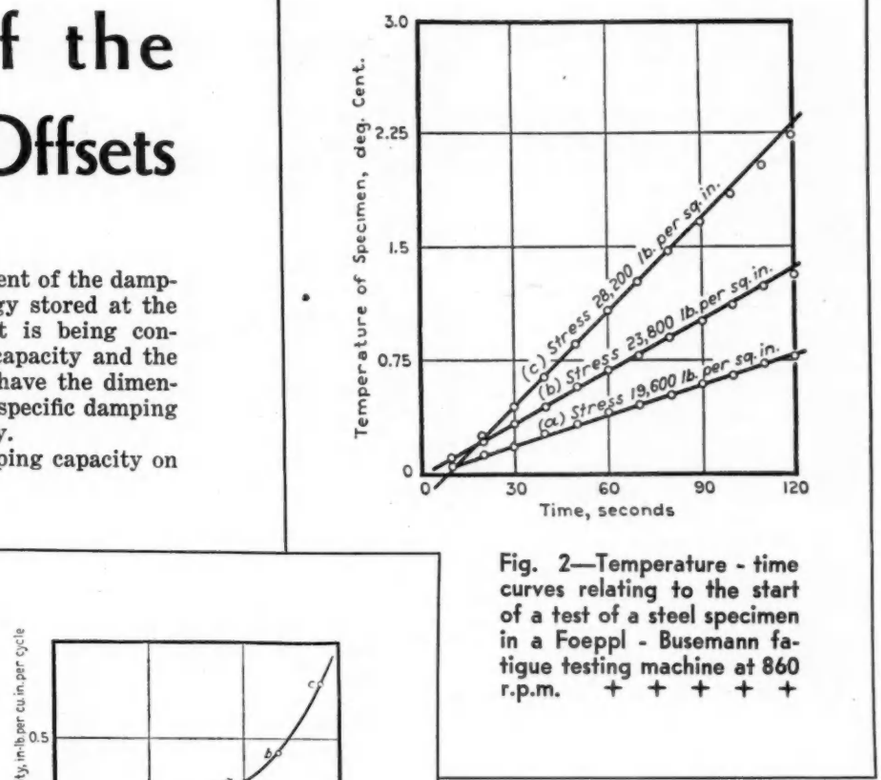


Fig. 2—Temperature - time curves relating to the start of a test of a steel specimen in a Foeppl - Busemann fatigue testing machine at 860 r.p.m.

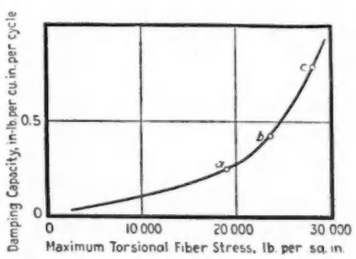


Fig. 3—Damping curve determined from Fig. 2

When a specimen is subjected to a complete cycle of alternating stress, the loading and unloading curves in the stress-strain diagram deviate from each other. It takes, of course, extremely sensitive instruments to show the deviation if the stress range through which the specimen is carried is small. The loading also has to be very accurate, and loading by dead weights is the most practical method. For this reason the hysteresis test has been made chiefly by applying torsion or bending stresses, rather than tensile stresses. A much greater deformation can be produced, by a comparatively small dead weight, in torsion or bending than in tension.

A stress-strain diagram for a complete cycle forms the hysteresis loop (Fig. 1), the area of which represents the work absorbed. The area under the loading line, from zero to the maximum stress, is the potential energy due to the elastic deformation.

As would be expected, the rate of loading does not affect the amount of work absorbed. By the ordinary static method a complete cycle of stress requires about 5 minutes. Becker compared the hysteresis determined in this way with that obtained at speeds of 2600 cycles per minute, using different methods, and his results indicate that the damping capacity is independent of the rate of applying the load.

Autographic records of the hysteresis loop in tension and compression have been made, but the apparatus required cannot be built cheaply and is exceedingly delicate. Hence the usual practice so far has been to use sensitive strain gages and plot the results point by point. What it is desired to determine in this test is the slight difference in the strain between the loading and unloading curve. The ordinary strain gage and testing machine are not sufficiently accurate for this purpose.

If a fatigue-testing machine is available which permits accurate determination of the temperature of the specimen, the so-called starting test furnishes the damping value in a very convenient way. Obviously the damping energy is converted into heat, so when repeated cycles of stress are applied on a fatigue machine, the temperature of the specimen is raised. This heating effect can be observed even for stresses far below the fatigue limit, unless most of the heat is immediately carried away to the grips and adjacent machine parts. The method is particularly applicable to machines using long gage-length specimens (say ½ in. diameter by 8 in. long), particularly in connection with non-rotating bending, tension or torsion fatigue machines. The non-rotating machine, of course, is better adapted for temperature measurements by thermocouple than is the rotating type of machine.

The "starting test" for determining the damping capacity consists in reading the temperature of the

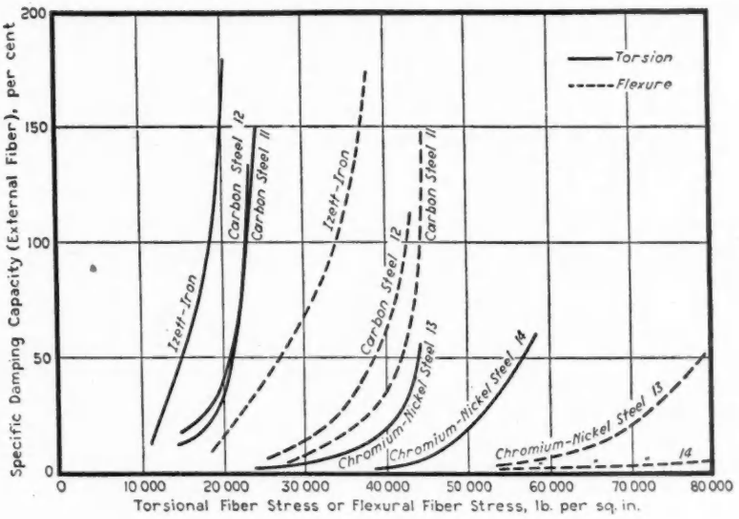


Fig. 4—Comparison of damping values in torsion and flexture

specimen after successive short-time intervals from the moment of starting the machine. Plots of temperature vs. elapsed time for a steel specimen for three different fiber stresses are shown in Fig. 2. This was a torsion test, and it will be noted that the initial portion of the plot is straight. It can be shown that the slope of this straight part is proportional to the damping capacity. To convert the values shown by the curve of Fig. 2 into damping capacities, it is only necessary to know the specific heat of the material. This has been done in Fig. 3, where the damping values corresponding to the three fiber stresses are plotted.

When the "starting test" is continued to make it a real fatigue test, the specimen finally—in about an hour—reaches a constant temperature. This equilibrium temperature varies with the room temperature and other external conditions. The factor of proportionality is easily determined by stopping the machine and watching the temperature drop after the internal generation of heat has ceased. From the rate of temperature decrease the rate at which heat is supplied when the temperature is constant can be calculated by a method familiar to electrical engineers, who use it to determine the losses in generators and electric motors. By using the combined equilibrium and stopping tests, the damping capacity can be determined with great accuracy.

There is one group of instruments that are specially designed for measuring damping capacity. The fundamental principle of these damping machines is that the specimen performs free vibrations which are damped only by internal friction. It has been shown, however, that external losses (damping effects) may make the results highly erratic. Results with this method can be relied upon only if accurate checking methods are available, but once the machine is calibrated, the method is said to be superior to all others, because the whole damping characteristic from zero stress to the yield point can be determined by a single test which, as a rule, requires only 20 minutes. Mr. von Heydekampf stated in his paper that so far as he knew the only damping tester now on the market is the Foepple-Pertz, of which only incomplete descriptions have been published so far, but which will be more fully described in a paper to be presented before the A. S. M. E. next December.

There is also a method for determining damping capacity by the measurement of a lateral deflection. A. L. Kimball discovered that a rotating cantilever shaft (in an endurance test machine) when loaded at its free end by a weight does not deflect merely in the vertical direction, as one would expect on first thought, but also laterally, the lateral deflection being proportional to the damping capacity of the material. Kimball has shown also that damping capacity or internal friction can cause undesirable whirling effects.

From Fig. 4 it may be seen that the damping capacities of different steels differ considerably, and since crankshafts generally are made of given dimensions regardless of the character of the steel used, owing to rigidity requirements, it follows that the amplitude of torsional vibration can be influenced by choice of material.

The damping properties of the material should be studied in conjunction with its fatigue properties. Results obtained at the Woehler Institute in Brunswick are said to have shown that there is no way to determine the true endurance limit by damping tests. Curves of damping capacity or specific damping capacity vs. fiber stress have no knee or other irregularity indicating any point such as the fatigue limit. In other words, "damping tests or, what is the same thing, rise-of-temperature tests are not reliable short-time fatigue tests."

There is a relationship, however, between the damping capacity and the static stress-strain diagram. We may write $\gamma = e_{pl}/e_{el}$, where e_{el} is the deformation which should occur according to Hooke's law and e_{pl} is the actual deformation. Within a certain range of stress, which normally coincides with the range up to the fatigue limit, e_{pl} represents half of the width of the fatigue loop. O. Foepple has found, by numerous experiments, that for steels $\gamma = 0.2\ p$ approximately, where p is the specific damping capacity. The coefficient really is variable, ranging from 0.18 to 0.23. The damping curve, therefore, is merely a form of stress-strain diagram, and the latter can be plotted from the former. The accuracy of the damping curves is much higher than that of the usual stress-strain

diagrams. For a certain chrome-vanadium steel, for instance, it is found that $p = 0.006$ at a stress of 15000 lb. p. sq. in. The plastic deformation then is

$$e_{pl} = e_{el} \times \gamma = e_{el} \times 0.2p = \frac{S}{E} \times 0.2p = \frac{15000 \times 0.2 \times 0.0006}{12000000} = 0.0000015 \text{ in.}$$

It is very difficult to determine such small non-elastic deformations by means of ordinary strain measurements, because even if an extensometer of sufficient accuracy is available, the accuracy of the loading system of the present standard testing machines is hardly high enough. Damping tests, however, readily permit the determination of such small values of p, and the damping curve therefore should be used as a modified stress-strain diagram for small stresses. This is in accordance with the tendency toward higher accuracy in determining the so-called "proportional limit."

From the smoothness of the damping capacity-torsional stress curve it is obvious that there is no actual "proportional limit," for if there were, the values of p should be zero up to the "proportional limit." Such an initial value does not exist for any material, not even for porcelain, glass or extremely hard and brittle steel. The damping tests confirm once more the fact that Hooke's law is only an approximation. O. Foepple therefore has proposed discontinuance of the term "elastic limit" and measurement of the amount of damping or non-elastic deformation that occurs at the endurance limit. It has been proved beyond doubt that even with billions of cycles the energy absorption or damping effect goes on without impairing the material or starting failure. So the fatigue limit and the corresponding damping value, which may be called the damping limit, should be coordinated in a way similar to tensile strength and elongation. "Damping limit" and "elongation" both measure plastic behavior, while fatigue limit and tensile strength give stress limits in the respective ranges.

From this analogy the name "dynamic ductility" for the damping capacity will be understood, while the elongation will be differentiated as the "static ductility." This is believed to be one of the most important features of the damping effect. For example, duralumin would be a dynamically brittle material (low damping values), while cast iron must be considered as dynamically ductile (high damping values). For these materials, the static ductilities are opposite and cannot account for the experience of fatigue and notch fatigue tests that surface defects have a very high influence on the life of duralumin specimens, whereas cast iron is almost unaffected by accidental imperfections of surface.

Recent tests at the Woehler Institute indicate that at least for the materials tested (various carbon steels, alloy steels, bronze, brass, light alloys, cast iron) the dynamic ductility as measured by the damping capacity seems to be related to the "tenderness" effect. In other words, a material of higher damping capacity is less sensitive to the influence of surface notches or sudden changes in cross-section, which strongly affect the fatigue strength of "dynamically" brittle materials. Materials having high damping values are able to be deformed to a higher degree than Hooke's law predicts without being damaged. In this way, "stress raisers" may be compensated for by internal yielding, the amount of which is measured by the damping capacity.

Core Oils Are Investigated

THOSE concerned with foundry practice will find some interesting material in Bulletin No. 221 recently issued by the University of Illinois, Engineering Experiment Station. This report, "An Investigation of Core Oils," by Carl H. Casberg and Carl E. Schubert, gives the results of a study conducted (a) to determine whether or not there is a relation between the tensile strength of cores and the physical and chemical properties of core oils used as a binder; and (b) to determine the effect of moisture on the tensile strength of the baked cores.

The investigation included a variety of core oils and the results found should be applicable to the core oils on the market at the present time. The following are the principal conclusions:

(1) Graphical correlation of the average original tensile strengths of the cores with the specific gravity, percentage of ash, flash point, and fire point of each respective core oil showed that no definite relations exist between these factors. Therefore, it would not be advisable to predict the strength-producing qualities of core oils on the results of a single test, but a complete analysis of all the physical and chemical properties of a core oil should be used to determine the quality or grade of the oil.

(2) The initial tensile strengths of the baked cores made from the ten oils by standard methods of mixing, ramming, baking time, and baking temperature, were found to be proportional to the saponification and iodine numbers of the core oils, and may be calculated from the following equations:

$$\frac{\text{Tensile Strength}}{\text{Saponification Number}} = 0.77$$

$$\frac{\text{Tensile Strength}}{\text{Iodine Number}} = 0.90$$

(3) The percentage loss in tensile strength of the baked cores made from the ten oils was found to be proportional to the amount of water absorbed by the cores, and may be calculated from the equation

$$\frac{\text{Water Absorbed by the Cores}}{\text{Percentage Loss in Tensile Strength}} = 0.00037$$

(4) The amount of water absorbed by the baked cores made from the ten oils varied inversely with the original tensile strength of the cores.

Speedboat Records Due for Upset at

Design of Gar Wood's entry is suited to take sharp turns on Detroit course + + + + +

England's hope may find choppy seas troublesome to negotiate

SATURDAY, September 5, the first heat of the important British International (Harmsworth Trophy) motor boat race will be run in Detroit. Another heat, of 30 nautical miles, will be held on Labor Day, September 7. This event will be the 17th race for the world's oldest prize for gasoline-propelled craft and a trophy on which millions of dollars have been spent in competition.

It was offered by Alfred Harmsworth, Lord Northcliff, in 1903 and was won then by a British boat, Napier in Irish waters. The winner made the then astonishing speed of 19½ miles an hour.

Commodore Garfield A. (Gar) Wood, of the Detroit Yacht Club, captured it in 1920 and has since defended it sucessfully five times. The battle for world speed supremacy which has been waged between Gar Wood and Kaye Don, the British pilot, for the past year or so will be continued in Detroit.

Early this year Mr. Wood drove Miss America IX 102.256 m.p.h., and two weeks later, April 2, Don piloted Miss England II 103.49 m.p.h. on the Parana, Argentina.

To date U. S. contestants have competed in the Harmsworth race 13 times and have been victorious 10 times. England has won five races and France, on a protest, once. America did not enter into this international affair until the fourth race in 1906. That year W. Gould Brokaw took his boat, *Challenger*, to England but was outclassed by the British boats.

In 1907 E. J. Schroeder took the first of the great dynasty of Dixies, four of which were never defeated in competition, to Great Britain, defeated the two British defenders and brought the Harmsworth trophy on its first trip across the Atlantic. Since then it has been in England for only one long visit, beginning in 1912 with the victory of Sir Mackay Edgar's Mapleleaf IV which defended it successfully in 1913.

Then the trophy lay dormant during the War years until Commodore Wood's victory at Cowes with Miss America I in 1920 in which he beat Mapleleaf V and VI and two French boats entered by Monsieur Despujols at 61.51 miles an hour.

England is sending over Miss England II, now the fastest motor boat in the world. This craft was designed by the late Sir Major Henry O. D. Segrave, who had previously established a world's automobile speed record on Daytona Beach, Florida, where he met Gar Wood and became interested in motor boat racing.

Sir Henry's first boat building venture was Miss England I, a fast, stable and interesting craft. She was not fast enough, however, for Harmsworth race purposes and Miss England II resulted from his study and experimentation of two years in which he introduced many unorthodox features into his craft, the construction and operation of which were and still are being financed by Lord Wakefield. This craft is 38½ ft. long and her beam is 10½ ft. She weighs approximately 9000 lb. and is equipped with two supercharged Rolls-Royce engines totaling 4100 hp.

It was against the advice of Gar Wood that Major Segrave placed the engines in Miss England II behind the seat on which the driver and two mechanics sit. When high speed racing boats capsize or strike an obstacle in the water they develop a tendency to dive. Major Segrave lost his life when his boat upset after beating Gar Wood's long-held world's record of 93½ miles an hour with a new mark of 98.76 miles, the water smashing

Harmsworth Trophy Winners

Year	Place	Name of Boat	Owner	Speed
1903	Queenstown, Ireland	Napier I	S. F. Edge	19.53 m.p.h.
1904	Solent, England	Trefle-A-Quatre	E. B. Thubron	26.63 "
1905	Arachon, France	Napier II	S. F. Edge	26.03 "
1906	Solent, England	Yarrow-Napier	Lord Montagu and Lord de Rothschild	15.48 "
1907	Solent, England	Dixie I	E. J. Schroeder	31.78 "
1908	Huntington Bay, L. I.	Dixie II	E. J. Schroeder	36.11 "
1910	Huntington Bay, L. I.	Dixie III	F. K. Burnham	36.04 "
1911	Huntington Bay, L. I.	Dixie IV	F. K. Burnham	40.28 "
1912	Huntington Bay, L. I.	Maple Leaf IV	Sir E. Mackay Edgar	43.18 "
1913	Osborne Bay, England	Maple Leaf IV	Sir E. Mackay Edgar	57.45 "
1920	Osborne Bay, England	Miss America	Garfield A. Wood	61.51 "
1921	Detroit	Miss America II	Garfield A. Wood	59.75 "
1926	Detroit	Miss America V	Garfield A. Wood	61.118 "
1928	Detroit	Miss America VII	Garfield A. Wood	59.325 "
1929	Detroit	Miss America VIII	Garfield A. Wood	75.287 "
1930	Detroit	Miss America IX	Garfield A. Wood	77.390 "

the Detroit-Harmsworth Trophy Race

Shifts of the World's Record

1923	Gar Wood	Miss America II—2 Liberty Engines, 415 hp. ea. 80.567
1928	Gar Wood	Miss America VII—2 Liberty Engines, 1060 hp. ea.—92.8
1929	Gar Wood	Miss America VII—93.123
1930	Maj. H. O. D. Segrave	Miss England II—2 Rolls-Royce 2050 hp. ea.—98.76
1931	Gar Wood	Miss America IX—2 Packard Engines, 1060 hp. ea.—100.6
1931	Gar Wood	Miss America IX—101.154
1931	Gar Wood	Miss America IX—102.256
1931	Gar Wood	Miss America IX—103.065
1931	Kaye Don	Miss England II—103.49
1931	Kaye Don	Miss England II—110.223

him back into the engine and killing him while the boat was traveling at probably more than 100 miles an hour.

It is possible that England will also send over Estelle V, the fast craft of Miss Marion Barbara Carstairs, which broke down after passing Miss America IX and Miss America VIII in last year's race. Many boating experts believe that this is the fastest manageable boat ever built.

It is probable that Gar Wood will have two boats in the race and possibly three, there being nobody else in America willing to undergo the expense of competing in the unlimited power class. Each country is allowed a team of three boats and one owner may enter that many in a race. This rule is generally frowned upon by American yachtsmen as being unfair to a single challenger. The rule, however, is part of the original deed of gift and has been authorized by the International Motor Yacht Union in which we have only one vote out of twenty. Wood's boats may be the Misses America X, IX and VII.

Miss America X is expected to be just under 40 ft. in length and equipped with Packard motors totaling 3600 hp. or 4240 hp. With such a craft it is almost certain that Wood could make from 125 to 130 miles an hour or more over a mile straightway.

Miss America IX is sure to be in the race. She is 28 ft. in length (10½ ft. shorter than her British rival) and has a beam of 8 ft., 7 in. Mr. Wood recently said he would not risk the use of superchargers in the Harmsworth race, but if suitable American superchargers could be devised, he might use them in attempting to establish a new one mile world's record some time later. The British, in creating light weight, high speed engines for airplanes have created superchargers which seem to work. The Rolls-Royce engines in Miss England II, Napier and Estelle V are aero type powerplant built for the British Air Ministry for use in the Schneider seaplane cup races.* No such motors have been built by American manufacturers.

"The British Government is subsidizing the development of high power aviation engines," Mr. Wood recently said. "The result constitutes a marvelous world-wide advertisement for British machines and British engineering, not to mention its vital value for sterner purposes. With Segrave's engines, I think Miss Amer-IX could do 120 miles an hour. Under sponsorship of the British Air Ministry, the English motor makers have discovered the secret of low weight per horsepower and they are guarding it well.

"The new Napiers, weighing less than 1600 lb., deliver 2500 hp. each, with superchargers. The Rolls at the same weight develops 2000 hp.

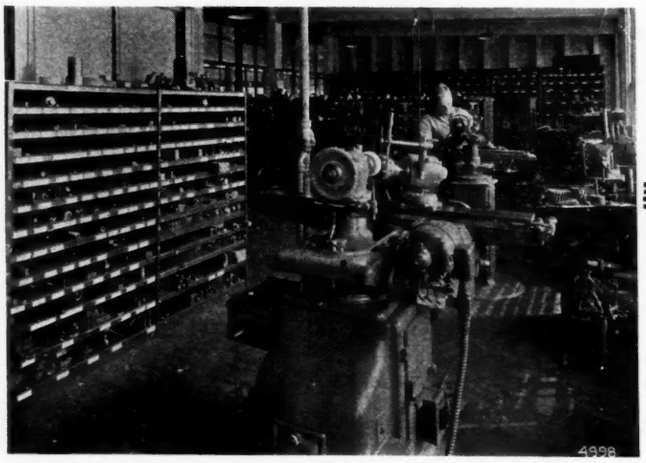
"I should like to see our government adopt a similar attitude toward high power in this country. At present we seem to have reached pretty nearly our limit in power. The superiority of Europe in this direction is, naturally, due to the keen rivalry between France, England and Italy in the air. Our non-participation in the Schneider Cup races is largely responsible for our lagging behind in aerial power plants."

The engines in Miss America IX are the 12-cylinder Packards which went to the bottom of the Detroit River in 1928, were rebuilt in three weeks by the company in time to win the Harmsworth race that year, and later in the same season sank in the salt waters in Venice when Phil Wood was driving Miss America VII in the races there and upset.

The see-saw race for the one nautical mile record which has been going on between Kaye Don and Gar Wood for the past eight months or so is a remarkable sporting event. For many years the record stood at 80.567

(Turn to page 286, please)

*"Is High Speed Competition a Dead Issue in This Country?" By Athel F. Denham, page 826, *Automotive Industries*, May 30, 1930.



PRODUCTION LINES

The new tool crib system at the Norton Company plant is interestingly worked out on a decentralized plan, which seems best fitted to the manufacturing program of the Division. There are in all, six mills devoted to grinding machine manufacture and there are nine tool cribs, located at the spot most convenient for the departments which it serves.

Each tool has a definite place assigned to it in each crib. The location is numbered with the tool number and the part number or numbers on which it is used. Each crib is equipped to keep tools in first-class condition. Tools never leave the department for which they were made. This view shows a corner of one of the nine cribs in the Machine Division.

Precision, and How!

Just a year ago several of the largest automotive manufacturers became interested in a new electric gage emerging from the General Electric laboratories. It was decribed in *Automotive Industries*, July 5, 1930, page 144. This department got a special kick from a recent announcement to the effect that this gage will be placed on a production basis and will be actively marketed by Pratt & Whitney. It will be known as the Electrolimit Gage under the new arrangement. According to the present plans P & W will design a standard gaging head to be used in conjunction with the General Electric indicating electrical devices. Standardized brackets and fittings will be available for mounting the gaging head for various types of work, so that in the near future the Electrolimit Gage will be standardized for a great many different production applications.

Free-Cutting

Anaconda free-cutting phosphor bronze has aroused so much interest in screw machine circles that we asked the makers for some details concerning its machinability. Here's what the research department of the American Brass Co. reports in part:

Anaconda "Special" phosphor bronze can be machined readily using exactly the same practice that you would use with leaded yellow brass. Screw machine operators tell us that they set their tools at the same pitch as they do for yellow brass and use the same speeds and the same lubricants. They find that this alloy cuts just as easily and freely as yellow brass, the only difference being that tool life is not quite as long as it is when cutting brass. However, the difference is so slight that most users figure the same production cost in machining both materials. One thing operators like particularly about Anaconda free-cutting phosphor bronze is that it cuts with a short, fine chip which causes no trouble in fouling the tools.

Something on the Ball

Three chief constituents of grinding wheels are analyzed in "Grits and Grinds" (published by the Norton Co.), June, 1931. These are: (1) the abrasive grain; (2) the bonding material by which the grains are held together, and (3) the pores or voids within the solid network formed by the grain and the bond.

By the new Norton controlled structure method of making grinding wheels, these constituent parts may be accurately regulated. Thus making it possible to more intelligently vary the properties of a wheel to obtain precisely the desired grinding action.

Machines Nicely

More and more, heat-resistant stainless steel is being used in making pump shafts, valve stems, screws, and the like. To step up production and justify this widespread use, the Republic Steel Corp., recently developed Enduro-FC, a free-cutting stainless steel. It is said to machine as freely as Bessemer screw stock. And thus opens applications in turning boring, drilling, threading and grinding.

Selling Safety

With an improvement in the accident rate of 75.47 per cent over the previous period the mechanical division of the B. F. Goodrich Co. won the John Noonan Safety Trophy for the first six months of this year. It was the second successive victory for that department, which will gain permanent possession of the trophy by winning it again. The Miller Rubber Co. was second.

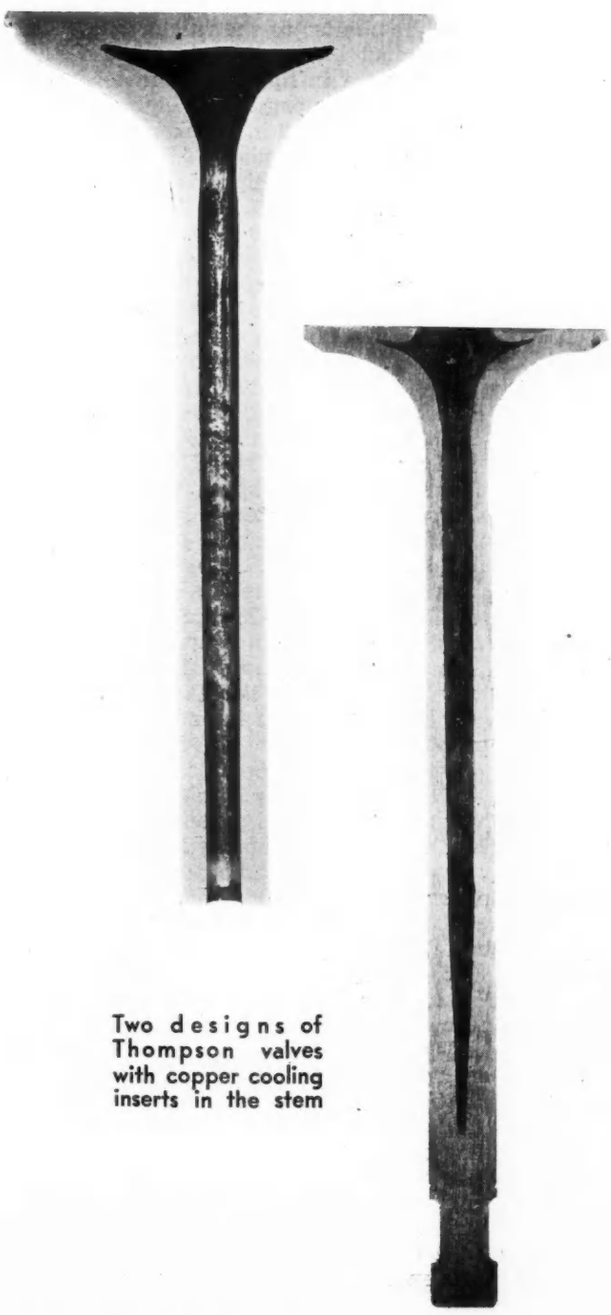
Stimulates Thinking

Motion pictures have a distinct educational value. Particularly in the training of foremen and apprentice groups. To disseminate information about the electrical industry, General Electric announces a new series of educational films and slides which may be obtained through their publicity department. Picking at random the following titles sounded mighty interesting to us: the Apprentice Course, Enameling by Electric Heat, Lighting in Industry, the X-Ray. There are many others.—J. G.

MANUFACTURING MANAGEMENT METALLURGY

Copper-Cooled Valves Are Introduced by Thompson

The copper running down the stem is said to be always centered and a perfect bond between the two metals is claimed



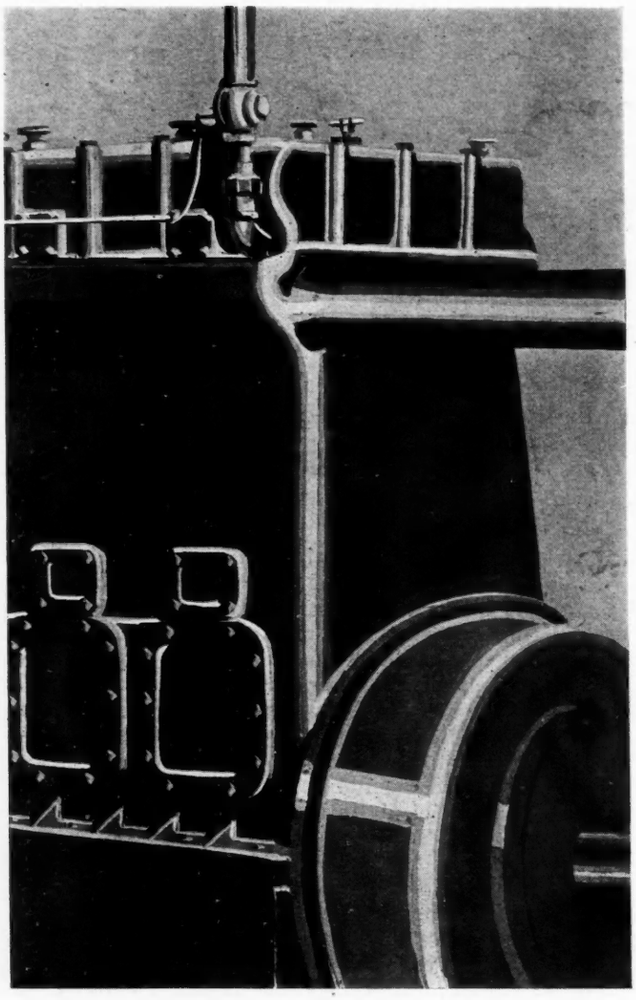
Two designs of Thompson valves with copper cooling inserts in the stem

COPPER cooling for valves differs basically from other methods in use (such as salt cooling, for instance), as it depends on conduction rather than convection for its effect. The thermal conductivity properties of aluminum and copper are well known, and for many years efforts have been made to fill valves with these substances by drilling out the valve stem and pushing in rods of the material. However, it was impossible to avoid air pockets; therefore a good bond was not obtainable, and the conductivity was greatly diminished. For that reason the system was not satisfactory.

In the case of the copper-cooled valve now manufactured by Thompson Products, Inc., copper is forged symmetrically into the valve stem and head. The copper is forced well out toward the seat, so it will take heat from the head. The copper running down the stem is said to be always exactly centered. Except in the cases of a few steels, a perfect bond exists between the copper and steel following forging. In cases where no bond forms, the fit is so tight that conduction is not appreciably impaired.

While the heat conductivity of aluminum is slightly better than that of copper in the high temperature ranges, improving as the temperature rises, the conductivity of copper remains almost constant, being much the better of the two at the low motor operating temperatures. Alloying steel seriously reduces its ability to conduct heat. Copper transmits heat 20 times better than CNS steel, used for Thompson exhaust valves, experimental determination shows. A valve stem with a copper core 40 per cent of its diameter will actually transmit as much heat as a solid valve stem three times the diameter. Conductivity by test is two-thirds the theoretical.

Copper-cooled valves are said to have proved superior to solid steel valves in operation. During a recent test an engine of a popular make had been run for 50 hours at a speed of 3000 r.p.m. Looking through the ports, the standard exhaust valves were a bright red, while the copper-filled exhaust valves were a very dull red. The difference in temperature measured at the underside of the head, where the flame impinges, was 150 deg. Running tests also show that the stem temperature is far more nearly uniform with a copper inlay, heat being distributed over the entire section. Guide temperatures run slightly higher, but it is stated that when valve stems are fitted with conventional clearances no trouble is encountered.



The Application Has Developed

EVER since the close of the war there has been considerable interest in high-speed oil engines in Great Britain. Up to a few years ago, however, this was confined to the larger sizes of engine, for marine work, railcars, and airships. Extensive research on the subject was carried out at the Royal Aircraft Establishment at Farnboro and a number of papers on topics connected with oil-engine development were contributed to various technical and scientific societies by the men who conducted the research work there. That the work in Diesel engine development by private firms should have been done largely with a view to marine applications is quite natural, owing to the very extensive ship-building interests of the country. Aside from this, however, there seems to have been a tendency on the part of these firms to keep out of fields in which they would run into competition with quantity-produced gasoline engines. The chief attraction of the heavy-oil engine always has been its low fuel cost, and this, of course, is the more important the larger the engine.

Perhaps no other British high-speed Diesel engine has received so much publicity as the Beardmore, which has been made for both railcar and airship use. The Canadian National Railways have in operation about a score of railcars equipped with these engines, some of which have been in service for as long as four years. The ill-fated airship R-101 also was equipped with engines of Beardmore manufacture, which were similar to the railcar engines in general layout but had most of their structural parts cast in light alloys instead of in steel. The airship engine has eight cylinders of 8¼ in. bore by 12 in. stroke, and since it turns at 900 r.p.m. its piston speed is 1800 ft. p. m. The specific weight is 7.8 lb. p. hp. With an output of 585 hp. the brake mean effective pressure is 100 lb. p. sq. in.

Harry Ricardo has developed a special type of high-speed oil engine employing a single sleeve valve of the Burt-McCollum type. This engine in different designs and rather widely different cylinder sizes is manufactured by two different firms. Peter Brotherhood, Ltd., of Peterboro, manufacture two, three, four, six and eight-cylinder engines with a bore of 7½ and a stroke of 12 in. The speed is 900 r.p.m. and the piston speed therefore 1800 ft. p. m. Mirrlees, Bickerton & Day manufacture a three-cylinder engine of 5⅝ in. bore and 6½ in. stroke, which operates at 1200 r.p.m. and develops 60 hp., its specific weight being 45 lb. per hp. The specific weight of the Brotherhood engine is 39 lb. p. hp. in the case of the six-cylinder and 35 lb. p. hp. in the case of the eight-cylinder, which indicates that these are strictly heavy duty engines. They are intended chiefly for stationary purposes.

A feature of the Ricardo design is a high degree of turbulence, which is induced by admitting the air to the cylinder through tangential ports and then compressing it into a cylindrical combustion chamber in the cylinder head, coaxial with the cylinder but of smaller diameter than the cylinder bore.

Quite a number of small Diesel engines are being built for marine applications in Great Britain, and the speeds of these engines have been gradually creeping up in recent years. An example of this is the Gleniffer, made by Gleniffer Motors, Ltd., Glasgow. This six-cylinder engine has a bore of 6 in. and a stroke of 7 in. and develops 120 hp. at 900 r.p.m., its specific weight being 34 lb. per hp. A feature of the design is that the inlet and exhaust valves are located in the cylinder head, on the same axis, which is at right angles to the cylinder axis, the compression chamber being formed between the heads of the valves. A similar construction is followed by the firm of Ruston & Hornsby, Ltd., of Lincoln.

Developments in connection with strictly automo-

# of Diesel Engines to Road Vehicles in Great Britain Since 1928

tive type engines began in Great Britain in 1928, and a record of events in connection with this development was given in a paper recently presented to the Diesel Engine Users Association by Major W. H. Goddard, who himself has been active in this field. According to Major Goddard, a Mercedes-Benz truck with six-cylinder Diesel engine was imported into England in April, 1928. This was a four-wheeled truck with a six-cylinder engine developing 80 hp. at 1300 r.p.m. It was followed later by a six-wheeled truck of 10-12 tons capacity with the same engine.

During 1928 and 1929 a number of Saurer trucks with both four and six-cylinder engines were imported from Switzerland. The engine is of the Acro type, with auxiliary air chamber. According to Major Goddard, a great many of these trucks are now running in England.

Berna trucks have been imported from Switzerland in considerable numbers since 1929. These are fitted with Koerting four and six-cylinder engines, of the precombustion-chamber type.

In March, 1930, the first Diesel bus was put in service. It consisted of a Karrier six-wheeled bus chassis fitted with a Mercedes-Benz six-cylinder engine and was placed in service by the municipality of Sheffield. During the same month and only about a week later a Gardner 28-passenger bus was placed in service by the Barton Transport Co. at Beeston. This was equipped with a four-cylinder engine (the make is not mentioned), and since that date several more buses have been fitted with the same engine and placed in service at Beeston, where all are giving satisfaction.

At the end of September, 1930, there appeared the Pagefield-Gardner 5-6-ton truck which is fitted with a four-cylinder 50 hp. Gardner engine. The rear axle and transmission of this truck are specially designed for this four-wheeled truck and are said to be of great strength. This truck is now in regular production.

In October, 1930, a Karrier 7-8-ton truck was completed, which was equipped with a Gardner six-cylinder engine. The Karrier firm, as is generally known, are old-established manufacturers of commercial vehicles in Great Britain, but the truck chassis carrying the Diesel engine was specially laid out for the job. This is said to be a very sturdy truck that is well able to handle a 10-ton load if necessary.

On September 27, 1930, the first all-British Diesel-engined bus was put into service by the City of Leeds. This is a double-deck bus comprising a standard Crossley bus chassis with a Gardner six-cylinder 80-hp. engine. On the open road this bus is said to be able to cover 14-15 miles per Imperial gallon, and in town work from 12 to 13 miles. The maximum speed is 32 m.p.h. Similar buses have since been built for the cities of Sheffield and Manchester.

On September, 1930, a Laffly (French) 4-ton truck, equipped with a Junkers two-stroke opposed-piston Diesel engine of 45 hp. made the run from Manchester to London with a gross load of slightly over 8000 lb. The maximum speed was 28 m.p.h. and the fuel consumption was one Imperial gallon to 19.73 miles.

High-speed Diesel engines brought out in England during the past several years include the following:

The Lister, a four-cylinder, four-stroke engine with a bore and stroke of 4½ by 5¼ in. Its compression chamber is in the cylinder head and is in two parts which are separated by a valve operated by means of a handwheel from outside the engine. When the two parts of the compression chamber are in communication the compression ratio is 15 to 1 and the compression pressure about 450 lb. p. sq. in. gage. This is the normal operating arrangement. For starting, the smaller part of the compression chamber is cut off from the larger one and the compression ratio is then 19 to 1. This arrangement is used for starting when the engine is cold. The maximum fuel consumption is given as 0.48 lb. p. hp.-hr. An exhaust lifter is used to facilitate starting. The Bosch fuel pump is used, the fuel being injected into the main part of the combustion chamber.

Dorman & Co., manufacturers of automotive engines for the general market, have produced a two-

Manufacturers have held to fields in which they would not meet the competition of quantity-produced gasoline engines with a large proportion concentrating on marine use of the heavy-oil powerplants

cylinder engine with the Acro type of head. It develops 26 hp. at 1200 r.p.m. and is intended for tractors, railcars, etc. Its specific consumption is given as 0.45 lb. p. hp.-hr.

A four-cylinder four-stroke engine developing 35-40 hp. at 1000 r.p.m. has been developed by Blackstone & Co. Bore and stroke are 4⅝ by 6 in. and the compression ratio is 14 to 1. Blackstone's "patented spring injection" is incorporated and the amount of fuel injected is controlled by governor. The engine has separate cylinder liners. The consumption is 0.46 lb. p. hp.-hr. and an electric starter is employed.

A full description has appeared in these columns of the A.E.C. six-cylinder high-speed oil engine built by the Associated Equipment Co., a subsidiary of the London General Omnibus Co.* In fact, several of these engines have been imported into this country. The engine, which has a bore and stroke of 4.33 by 5.60 in., is said to develop 90 hp. at 2000 r.p.m. It has an Acro head and is equipped with the Bosch pump and atomizers. A distinguishing feature of the engine is that it has no governor.

Aveling & Porter have produced a four-cylinder heavy oil engine using the Acro principle. It has 4⅜ by 6⅜ in. cylinders and develops 50 hp. at 1300 r.p.m. The compression ratio is 14.5 to 1. Bosch pump and atomizers are used. Starting is by a 6 hp. electric starting motor fed from a 12-volt battery of 60 amp.-hr. capacity. The fuel consumption at normal load is given as 0.44 lb. p. hp.-hr.

Oil Motors Ltd. is exploiting in England the Hesselman engine, a Swedish development, which is not a Diesel but a low-compression heavy-oil engine with spark ignition. Turbulence is produced in the cylinders by air inlet valves which are masked over half their circumference, so that air can enter only through half of the valve, and the valve is held in such a position that the air enters tangentially, whereby a swirl is produced that is maintained during the compression stroke. It is claimed for this engine that it needs be built no heavier than a gasoline engine and that its fuel consumption is 25 per cent less.

A high-speed Diesel engine has been built also by Louis Coatalen, managing director of the Sunbeam Motor Car Co., and we understand that a license for the manufacture of this engine has been let to an American firm, but there seem to have been no production developments in connection with it in England so far.

Automotive Industries, February 14, 1931, page 233.

Peerless Model 25 is a Continuous Blue-Printing Machine

THE C. F. Pease Company, Chicago, Ill., announces the development of a new continuous blue-printing equipment intermediate in price between its Model 20 and Model 30. The new Model 25 comprises three units, the blue-print machine, the washing machine, and the potashing, washing and drying machine.

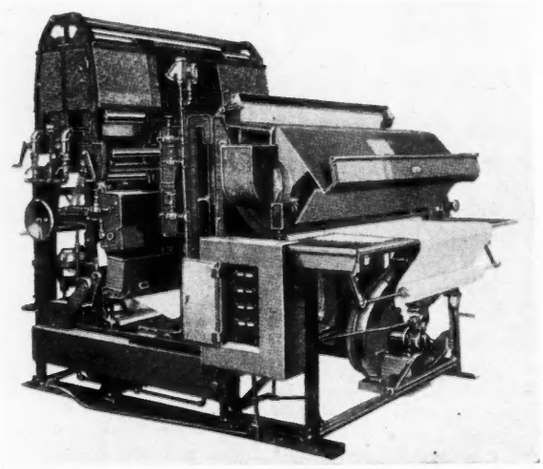
The blue-printing machine can be operated independently from the washing, potashing and drying equipment by means of a simple clutch adjustment. Also, it may be purchased separately and the washing, potashing, and drying equipment added later when desired. All units are made in two sizes, 42 in. and 54 in. wide, and the machines can be wired to operate on either direct or alternating current (220 volt). The 42-in. machine is equipped with six lamps and the 54-in. machine with seven. Each lamp consumes 6½ amperes on D. C. and 7½ amperes on A. C., but this amperage can be increased if faster printing speed is required.

The dryer of the Model 25 is new in arrangement. It is a twin-radiator air-type dryer, consisting of two banks of heating units between which the paper travels around a floating idler roll that can be raised or lowered by means of a crank-handle, thus making it easy to thread the paper through the machine. The machine can be equipped with either gas or electric heater, and the drying temperature can be varied by controlling individual heating units.

The gas-heated type dryer has two radiator heating units with individual gas feed lines, regulator valves, and push-button pilot lighters. When operating at full capacity, each unit consumes approximately 50 cu. ft. of gas per hour.

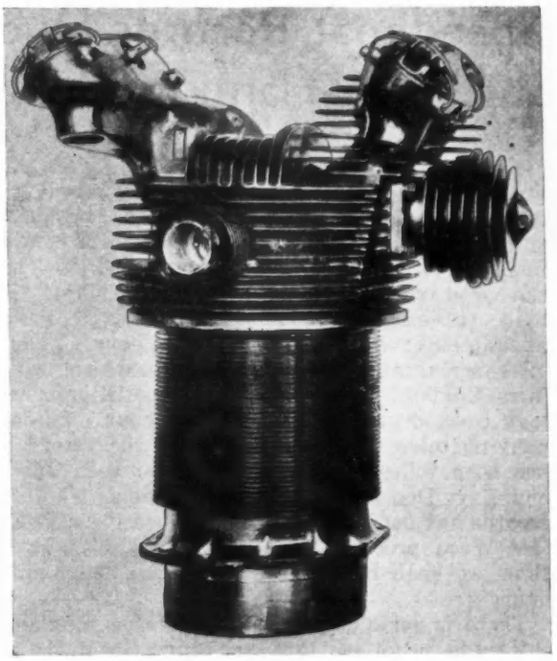
The electrically heated type dryer has two coil radiator heating units, each containing five sets of coils, each coil being controlled by a separate toggle switch in a panel box at the side of the machine. A contactor switch is provided so that when the drive motor is shut down, all heating units are automatically cut off in the dryer. When operating at full capacity, each heating unit consumes approximately 60 amperes, or a total of 120 amps.

A feature of the Model 25 dryer is the special side doors and sliding panels which assist the operator in overcoming difficulties in respect to humidity and still enable him to see the finished prints as they pass over the dryer and into the rolling-up device at the rear of the machine.



Peerless Model 25 blue-printing machine

Cylinder Heads on Wright Engines Have Spark Plug Coolers



New Wright air-cooled aircraft engine cylinder + + + + + + + +

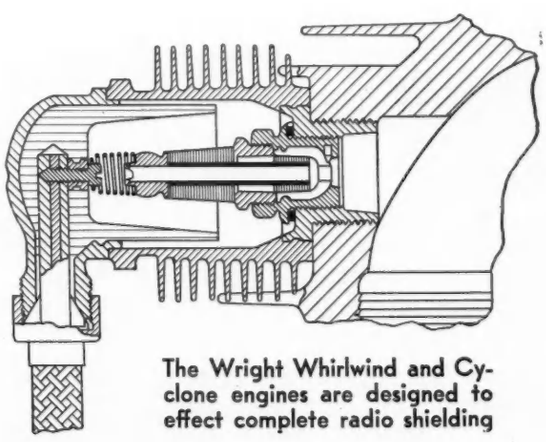
THE new type E cylinder head now used on all Wright Whirlwind and Cyclone radial air-cooled engines is designed to bring about lower and more uniform head temperatures. One of the principal features of this new cylinder head, which has about 50 per cent more available cooling area than the head used on previous models, are the two spark-plug coolers which serve to dissipate the heat from the point where it is most intense. These spark-plug coolers consist of bronze inserts of standard design cast integral with aluminum alloy cups which are finned on the outside to provide cooling area for the inserts. A terminal is attached to the end of each ignition wire, completely inclosing the spark plugs and protecting them from the corrosive action of the weather. They also adapt the engine to complete radio shielding.

The intake ports of Type E cylinder are at the rear of the engine, as on previous models, while the exhaust ports are on the side. The exhaust ports are supplied with finned cast aluminum elbows. Standard elbows which face the front are used with the front exhaust collector ring, but another type of elbow may be supplied to face the rear for use with short open stacks or a rear exhaust collector. These finned elbows, together with heavily finned exhaust rocker boxes, have aided materially in reducing operating temperatures.

The rocker support boxes are of a new design with increased felt capacity for lubricating rocker arms, rocker arm roller, bearings, and push rod ball end. The reduction in maintenance, time and cost has been effected by the use of balls to hold the rocker box covers in place, instead of the screws formerly used.

An exhaust manifold of annular form with connections to exhaust elbows, known as the tangential type, is furnished as standard equipment with each Whirlwind engine of the E type. Led in at a tangent, the exhaust gases pass through at constant velocity and continue in the same direction. These connections from the exhaust elbows to the manifold slide over the pipes from the exhaust manifold provide a free joint to permit free expansion and contraction of the parts. It is claimed that there is no back pressure in the manifold unless more than six feet of tail pipe are used.

All models of the Whirlwind and Cyclone series engines may now be equipped with radio ignition shielding of the conduit type designed and constructed to eliminate radio interference and protecting the ignition system against all natural and mechanical hazards. The shielding consists of a housing or covering for the entire ignition system. It preserves and protects the ignition cable from wear, tear and breakage due to exposure, and prevents it from becoming saturated with any liquid, including oil, water, etc. The main manifold ring is of seamless brass tubing specially made for this purpose. The leads are made of flexible aluminum tubing with a double braid—one a tinned copper braid and the other a protective armoring. These new leads or housings are attached to the manifold with a coupling nut. A compression packing gland seals these couplings, preventing moisture seepage and possessing sufficient pressure to eliminate any possibility of opening due to vibration. The ignition cable can be easily and quickly removed in whole or in part for replacement. Auxiliary shielding may also be provided for the primary wires to the switch and magnetos eliminating interference from this source and protecting wires from moisture and breakdown due to abrasion and abuse. The auxiliary shielding preserves and protects the primary cable connection, the two magnetos, the leads from the magneto to the booster magneto and to the ignition switch.



The Wright Whirlwind and Cyclone engines are designed to effect complete radio shielding

Speedboat Records Due for Upset at Detroit-Harmsworth Trophy Race

(Continued from page 279)

statute miles an hour made by Gar Wood in Miss America II in 1923. In 1928 Wood himself raised this record with Miss America VII to 92.8 miles an hour and later, with the same boat, to 93.123. During the speed trials in which he was killed, Major Segrave made two one-nautical mile runs in Miss England II at the rate of 98.76 statute miles an hour. Then came 1931, a real milestone in the sport in which two boats, Miss England II and Miss America IX, reached the long coveted goal of 100 miles an hour. The accompanying table gives the figures of the record which has been volleyed back and forth between Gar Wood and Kaye Don in the order of creation. The book of records has not by any means reached its last chapter. Gar Wood predicts that, within a reasonably short time, we shall have motor boats doing 150 miles an hour!

There is some doubt concerning Miss England II's ability to negotiate the sharp turns and the rough water of the Detroit course. It is said Major Segrave did not build her as a boat for long races and her light, high-speed, high-powered engines were built to run at full capacity for only four hours. Segrave estimated that, at speed, she would require half a mile to turn. One of the turns on the Detroit course is only 150 yd. while the greatest turn is only a quarter of a mile.

The moving pictures of Miss England making her one-mile records in South America on perfectly calm water show her squatting, wobbling and apparently hard to steer. On the Detroit five nautical mile course, with six laps to a 30-mile heat, the water is always exceedingly rough at the lower and sharpest turn. It is here that most of the British challengers to date have come to grief.

Gar Wood's boats, on the other hand, can take these turns at almost full speed through the skillful use of their twin screw installations. Miss America's rudder is a tiny thing, 4 x 6 in., only about the size of a postal card.

In the races on Lake Garda this year Miss England II was beaten by a much slower boat through her inability to take turns at high speed. Straightaway speed is only a small part of this 60 nautical mile race. Miss England II appears to be at least seven miles an hour faster than Miss America IX but the latter's ability, through her heavier construction and scientific hull design, to take turns at almost top speed, to negotiate the rough Detroit water and the long experience of the three Wood brothers, Gar, George and Phil, in driving 80-100 mile-an-hour boats over this course, with never a sign of a mechanical or hull breakdown, we consider Miss England II's chances dark indeed. Add to this the fact that Commodore Wood will probably have a new, larger and more powerful boat on hand which may even eclipse Miss England's straightaway speed and will have the added advantage of complete maneuverability.

Additional attempts at the speed mark are scheduled for the nautical mile course at Detroit immediately following the Harmsworth regatta. If the water is calm enough to make such trials feasible, and if the American and British boats survive the long Harmsworth race successfully, we shall certainly see something new and interesting in this see-saw race between Gar Wood and Kaye Don.

Curtiss-Condor Transports Have Added Safety Features

THREE Curtiss Condor Transports of a new design will soon be delivered to the Eastern Air Transport Lines by the Curtiss-Wright Corporation of New York. These ships carry a payload of 3800 lb. each, at a cruising speed of 125 m.p.h.

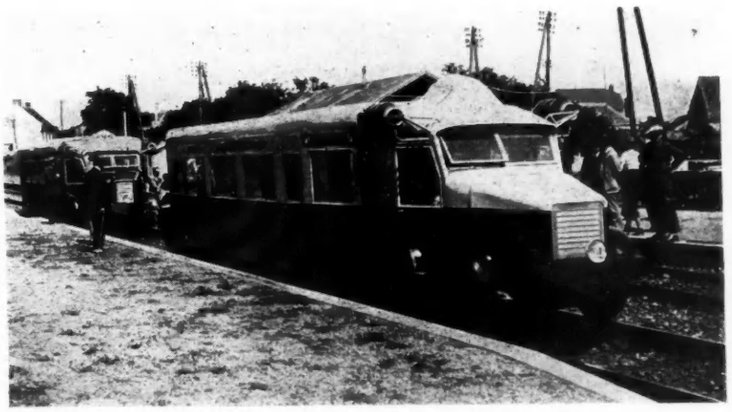
The Condor is powered by two geared 625 hp. Curtiss Conqueror water-cooled engines, mounted on the wings outside the fuselage. The absence of a nose engine improves the pilot's vision, and passenger comfort is enhanced by the reduction in noise and vibration and the elimination of exhaust odors.

Among the improvements affecting the performance are better streamlining of the nacelles, landing-gear fairings, and generous use of wing fillets and strut cuffs. The new ship has a high speed of more than 145 m.p.h., we are informed, and is able to fly on one engine in emergencies, its ceiling on one engine being 3500 ft., which can be increased to more than 5000 ft. by the use of the recently developed Curtiss variable-pitch propeller.

The absence of a nose engine improves the pilot's vision and adds to the passengers' comfort + +

French Railroads Adopt Pneumatic-Tired Wheels for Economy and Comfort

Despite badly kept tracks test runs were made at 80 m.p.h. with perfect safety and riding comfort + + +



Pneumatic-tired gasoline rail car produced by Michelin

GASOLINE rail cars equipped with pneumatic tires have been produced in France by the Michelin Tire Co. and are about to go into public service on French local railroads. The advantages of pneumatic tires over steel wheels are said to be less weight, increased speed, greater comfort, and considerably decreased operating costs.

Michelin has had to produce not only the tire to run on existing rails, but a vehicle suitable for the tires. Nine different models have been built and tested, and the type most suitable for service on local lines was found to be a 24-passenger car having an overall length of 42 ft., and a passengers' cabin 21 ft. by nearly 8 ft. This has five axles—three for the forward bogie and two for the rear, and is driven by a 20-hp. Panhard-Levassor, sleeve-valve engine, through a four-speed transmission. One axle is driven directly, and the axle immediately behind is driven from the former by chain. The two rear axles are trailers. Lockheed hydraulic brakes are applied to all wheels.

By reason of the narrow width of continental rails, the makers are limited to the use of tires of 33 x 4 in., these being mounted on standard 25 x 4-in. straight-side rims, the wheels being standard detachable steel disks with a railroad flange bolted to them. Inflation pressure is 85 lb. per sq.in. In order to clear the sleepers, switches and appliances attached to the rails, the wheel must not drop more than 5/16 in. when a tire deflates. This result is obtained by fitting a wood ring inside the tire and holding it to the rim by studs. Experimentally numerous tires have been instantly deflated by tearing out the valve. Except for the report, passengers are unaware that anything has happened, and the train does not deviate from its course. The wheel is changed in exactly the same way as for an automobile.

Pneumatic tires make it possible to reduce weight to that common for road vehicles, without any loss of adherence. Ten per cent gradients can be climbed with tires, whereas the maximum with steel wheels is 4 per cent. The dead weight of the 24-passenger car is 9614 lb.; useful load, 4752 lb., giving a total weight of 14,366 lb. Dead weight per passenger is 385 lb.

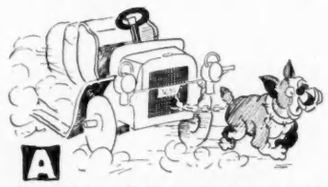
The maximum speed of the 24-passenger car is 62 m.p.h.; the normal speed on the level, 55 m.p.h., and the gasoline consumption one American gallon per 12 miles. From maximum speed the train can be brought to a standstill in less than 110 yd., compared with 1100 yd. for a steam train. It can attain a speed of 50 m.p.h. in a distance of 650 yd., whereas a steam train requires 1650 yd. On a 30-mile run the car averaged 57 m.p.h., with the maximum held down to 62, and on a 17-mile stretch, with 9 stops of 30 sec. each, the commercial speed was 33 m.p.h., or double the speed of an ordinary train working under the same conditions. The average tire life is said to be 22,000 miles.

To demonstrate the speed possibilities of pneumatic tires on rails a special car has been built with a Hispano-Suiza chassis. A normal chassis with a six-cylinder 3.94 x 5.52-in. engine is used, having clutch, standard four-speed transmission and standard final gear ratio. The frame members, rear axle and brakes are retained, only the axle being widened and the steering gear disconnected. A speed of 80 m.p.h. was maintained, with perfect safety and with more comfort than on the best long-distance trains, despite badly kept tracks, it is claimed.

Michelin suggests laying down wider rails, this allowing bigger section pneumatic to be used.

Automotive Oddities—By Pete Keenan

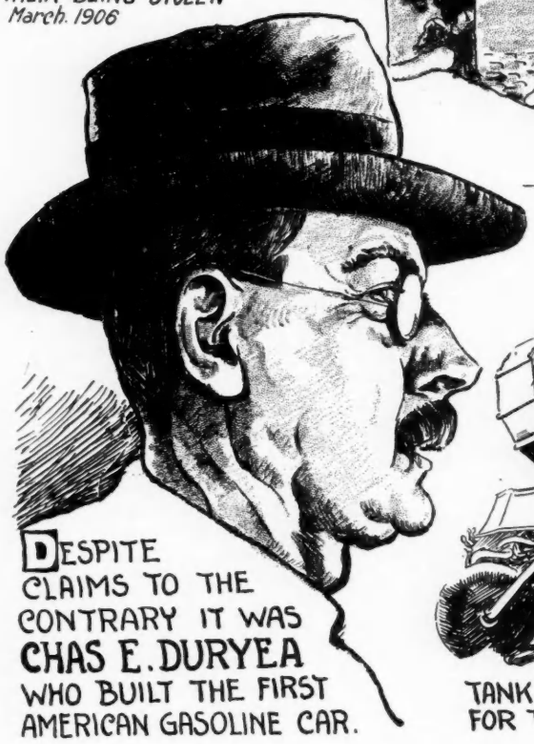
A RUNAWAY PLANE FLEW SAFELY FOR FIVE MINUTES
Piampino Italy 1931.



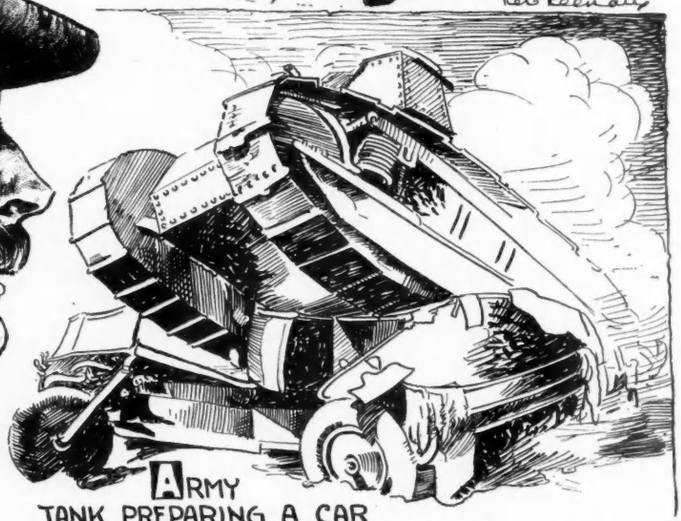
A BUFFALO FIRM TRIED TYING BULL DOGS TO CARS TO PREVENT THEIR BEING STOLEN
March. 1906

THE ONLY KNOWN AUTOMOBILE TOMB.
ERECTED TO LEVASSOR THE GREAT FRENCH ENGINEER WHO DIED AS HE WANTED TO WITH HIS HANDS AT WORK ON A CAR.

Pete Keenan

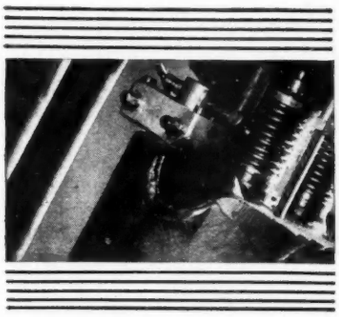


DESPITE CLAIMS TO THE CONTRARY IT WAS **CHAS E. DURYEA** WHO BUILT THE FIRST AMERICAN GASOLINE CAR.

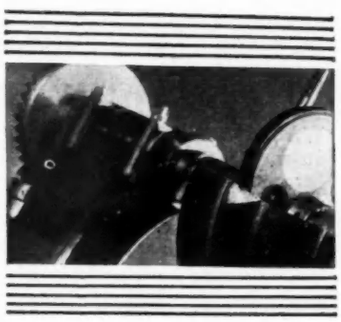


ARMY TANK PREPARING A CAR FOR THE SCRAP HEAP *Penn Military College. 1931.*

Correspondence about "Automotive Oddities" is invited. Contributions used will receive editorial mention when practicable. If you are interested in the source of, or the reason for, a particular "Oddity," ask the editorial department of Automotive Industries about it.



NEWS OF THE INDUSTRY



Ford Plans New Assembly Plant

Has Option on Land at Painesville, Ohio

PAINESVILLE, OHIO, Aug. 20—Ford Motor Co. has announced plans to buy land here for a $7,000,000 assembly plant. For more than a year the Ford company has had an option on 365 acres of land on the west bank of the Grand River, and well situated for lake and land traffic.

It is not known how soon work will be commenced on the project, but it is certain it will be in the near future. The plant will have a capacity of 400 cars a day. Ford now has an assembly plant in Cleveland with a 200-car-a-day capacity, and another in Buffalo with 400-car capacity a day. Whether the new plant will affect either of these could not be learned.

More than 2500 men are expected to be employed when the plant is completed.

Galion Gets Contract

GALION, OHIO, Aug. 20—The Galion All-Steel Body Co. has been awarded the contract for 200 hydraulic dump bodies by the State Highway Department of Pennsylvania, according to an announcement by the company officials. The contract is for the entire requirements in the recent letting of the Pennsylvania State Road Department. This is the second award that has come to the Galion concern in the present letting of the Pennsylvania Highway Department. The first was to the Galion Iron Works for 157 graders of various types.

Willys N.Y. Sales Gain

NEW YORK, Aug. 20—Willys-Overland registered more automobiles in the metropolitan area the first six months of this year than in the same period of 1930, A. W. Pickett, New York branch manager of Willys-Overland, Inc., announced today.

THE birthday of Orville Wright was celebrated over the radio Wednesday evening, August 19, under the auspices of the Vacuum Oil Co., but Mr. Wright was too shy to speak over the NBC mike . . . he couldn't even be reached at his Dayton home for an invitation. . . . Oils developed by Vacuum were used at the Kitty Hawk flight, the company claims * * * literature and the movies are at last catching up with modern developments in the automotive industries: last week we saw a show poster bearing an advertisement of "eight-cylinder love," and a current book advertisement brags about "sixteen-cylinder action" in the masterpiece it presents to the public. * * * W. Ledyard Mitchell, Jr., son of the Chrysler Export bigshot, has joined the Chrysler Detroit Co. as a salesman for Plymouth cars. * * * C. C. Winningham's son, C. L., was married in Cincinnati on the 15th. * * * The winner of the transcontinental sweepstakes handicap air derby at the National Air Races, to be held in Cleveland, Aug. 29-Sept. 7, will get a Cord cabriolet as a prize. * * * From now on until the end of the column you will be entertained by Edwin McK. Johnson, our Chicago correspondent, who has a mean eye for "Trailer" material. * * * A pheasant dinner dropped into the lap of W. J. Moore, Evanston, recently while he was driving into the city from Elgin, Ill. The bird crashed through the windshield and landed in Moore's lap. Somewhat upset by the incident, Moore drove his car into the ditch and out again and had a pheasant dinner at home that night. * * * A holdup victim recently plead with bandits that his car was not insured. The robbers, softening at his plea, took his phone number, and a few hours after the robbery they called him and told him where they had left the auto. And there it was. * * * The middle western regional code committee of the American Petroleum Institute at sessions here last week adopted recommendations for a survey to determine the extent of evasion of the Illinois gasoline tax. The action followed the exposure in *The Chicago Daily News* of wholesale bootlegging of gasoline in the Chicago district. * * * The Nebraska state railway commission is listing all taxicab owners in the state and has notified them that effective August 1 they must show they have obtained automobile liability insurance for their passengers. * * * Boeing system of United Air Lines claims a record for Chicago-San Francisco flights. Of 180 trips, 139 were ahead of time at either the Chicago or coast terminals. Average speed, including take-offs and landings, was 112 miles an hour. The company flew 99.8 per cent of its scheduled mileage, as only 795 miles out of 365,000 scheduled were not flown. * * * Chief of Detectives Norton has accepted delivery of 20 new Nash automobiles, twin-ignition straight eights, for use in the detective bureau,

(Turn to page 292)

THE NEWS TRAILER

Opel Introduces 1.2 Liter Model

Designed to Compete in Germany and Abroad

PHILADELPHIA, Aug. 20 — A new model Opel car was introduced on the German market this week by the Adam Opel Motor Works, controlled by General Motors Corp., according to press reports reaching this country. The engine of the new model has a displacement of 1.2 liters, and is apparently similar to the 1.8-liter type described in *Automotive Industries* for May 2. The latest type introduced is designed to compete in the small-car class, both in Germany and in the wide export market reached by Opel.

The Adam Opel Co., Germany's largest automobile manufacturers, controlled by General Motors, report a loss for 1930 of more than $3,000,000.

This is attributed in the report chiefly to a thorough reorganization of the production program, which entailed the discarding of a great part of the valuable machinery of the production plant. Current expenses advanced also by nearly $1,000,000.

General Motors abandoned the old Opel method of producing cars of all sizes and types and is concentrating now on the manufacture of small six-cylinder cars, of which more than 13,000 have been sold within a few months in Germany and abroad.

Although the sale of the new model in Germany is said to be extremely satisfactory, considering the business depression, it is hoped exports to other European countries will grow considerably in the near future.

Kelsey Reports Profit

DETROIT, Aug. 20—The Kelsey-Hayes Wheel Corp. reports net profit for the first half of this year of $633,762 after all charges and taxes, equal to 68 cents per share on 749,454 shares of common stock outstanding.

Hearings on Rail Rate Increases End; Shippers of Many Commodities Protest

WASHINGTON, Aug. 20—Coming to an end today, hearings in Washington before the Interstate Commerce Commission in connection with the proposed 15 per cent railroad rate advance case were shot through with testimony from shipping interests who protested that higher charges would increase rapidly the tendency to turn to motor trucks and other transportation channels and thus deprive the rail carriers of traffic and revenue. Evidence of this character was presented by shippers of a broad range of products. Among them were iron and steel, coal, vegetables and fruits, hay, food products, and other lines.

Accepting the accuracy of the prediction of these witnesses, a boost in rail rates would actually develop motor truck production and use and give a stimulus to the automotive industry that would be substantial. Railroad interests, however, were not inclined to take so sweeping a view of the effect of a rate advance as were protesting shippers, but on the contrary insist it would bring in much needed added revenue.

The protesting shippers submitted exhibits extensively showing motor truck movement, and growing diversions to this line of transportation from rail carriers. One of the interesting points they brought out was that motor truck traffic no longer is being confined merely to short hauls but is reaching out to long hauls and to all classes of commodities.

Anthracite coal operators and representatives of the United Mine Workers, told the commission that motor trucks already are taking coal directly from mines and delivering it to both short and comparatively long distance points at prices cheaper than it can be done by rail and that, therefore, decreased rather than increased rail rates are necessary if the railroads are to stop the loss of traffic.

Frank E. Carey, president of the F. E. Carey Coal Co., Chicago, and chairman of the Bituminous Trade Relations Committee of the National Coal Merchants' Association, said that higher freight rates on soft coal would result in trucks being relied on to perform the transportation service from the mines to consumers, to the detriment of the railroads. Supporting testimony of anthracite retailers, Mr. Carey said that trucking coal from mine to consumers is growing by leaps and bounds in all bituminous producing fields.

"In the last few years there has been a great improvement in hard roads throughout the country, and with that has come an extraordinary development in high-speed long-distance buses and trucks so that now it is possible for the truck owner to haul coal profitably from the mine over a radius of 40 to 60 miles at a cost which is less than existing freight rates for a similar haul," Mr. Carey said.

"This practice is increasing rapidly in West Virginia, Kentucky, Pennsylvania, Indiana, Illinois, Iowa, Missouri, and every producing district. I personally know a prominent retailer in Champaign-Urbana, Ill., who is even now equipping a fleet of trucks to move coal in this manner at a substantial saving against the freight rates he is now paying on coal from southern Illinois to his market. The retail coal business in Bluefield, W. Va., the metropolis of the Pocahontas field, is in danger of being wiped out by this kind of competition."

Tire Exports Hopeful

WASHINGTON, Aug. 20 — United States exports of automobile tires to European countries amounted to 436,017, valued at $4,540,116, in the first six months of 1931, compared with 566,261 tires, valued at $6,826,923, in the same period of 1930, a decline of 23 per cent in quantity and 33 per cent in value, according to the Commerce Department's rubber division.

At first inspection these figures appear far more disappointing from the viewpoint of the American tire exporter than is revealed by further analysis. The variance between the decline of 23 per cent in tire exports by quantity and the 33 per cent decline in value may be explained as the result of price-cutting caused by the severe competition offered by European tire manufacturers—such a decline in value not being in evidence in other world tire markets.

Furthermore, there were six European countries to which the United States exported a greater number of automobile tires in the first six months of 1931 than in the same period of the previous year. These countries were Czechoslovakia, Denmark, France, Sweden, Switzerland, and Yugoslavia.

Ford Adds to Powerplant

DEARBORN, MICH., Aug. 18—Henry Ford and Edsel B. Ford with Ford Motor Co. officials witnessed the cutting-in of the Rouge plant's latest addition to "Turbine Hall" when a 110,000-kw. capacity turbine generator lifted the capacity of the plant's principal power house to a total of 230,000 kw. per hour.

Toledo Names Fink

W. A. Fink has been appointed treasurer of the Toledo Scale Co., subsidiary selling organization of the Toledo Scale Mfg. Co., Toledo, Ohio.

British Car Makers Offer New Midgets

Standard and Invicta Invade Field Held by Austin and Morris

Two British makers have recently announced new models, each of which represents a new type in the small car class, nothing directly comparable with either having been offered hitherto. One is known as the "Little Nine" Standard, a replica of the same maker's "Big Nine," which has been one of the most popular small cars in England for two years past, but while the new model seats four adults in comfort its four-cylinder engine is 1005 cc. as against 1287 cc., while its wheelbase and track are 90 in. and 44 in. respectively, as against 100 in. and 48 in. With a metal sedan body having four doors, six lights, sliding roof and three speeds its price is £155, which compares with £205, the new and reduced price of the four-speed "Big Nine." Both have silent next-to-top gears. Dealers anticipate a big demand for this new type, which is appreciably larger than the Austin Seven, Morris Minor and other "baby" cars.

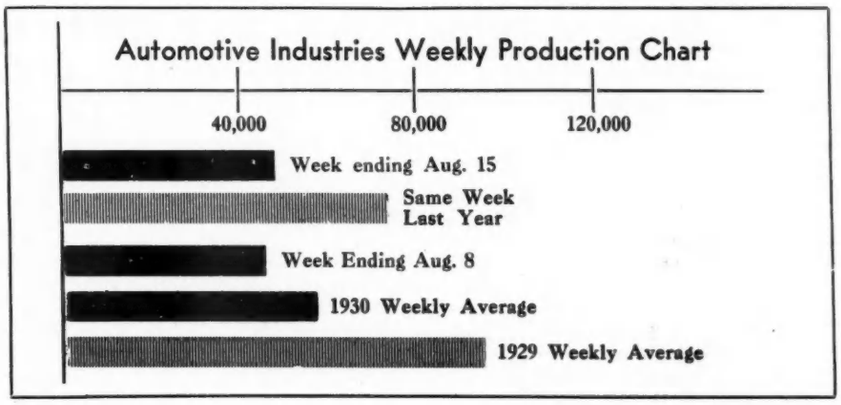
The second new type is an Invicta Six, a make hitherto confined to cars of 4½ liters. It has a high-efficiency overhead camshaft engine (7 to 1 compression) of only 1¼ liters, and yet its wheelbase and track are 118 in. and 56 in. It is intended for full-sized, five-passenger bodies, and with a high gear ratio of 6 to 1 it will attain 65 m.p.h. The engine develops approximately 50 b.hp. at 5000 r.p.m. It is an expensive job in comparison with small cars of similar power, the price of the sedan being £400; it is not intended, however, to compete with small cars but with 20-hp. models, its attraction being its low taxation, for it is rated at only 10 hp. under the British tax formula.

Laying Non-Skid Road

WASHINGTON, Aug. 18—Work has begun in Sheffield, England, on the relaying of nearly 2,000,000 sq. yd. of road with a new surface which, it is claimed, is non-skid, according to a report to the Department of Commerce.

The city engineer of Sheffield, W. J. Hadfield, who has devised the new surface, in a press report is quoted as saying: "The trouble in cities has always been to provide a road surface that would be non-skid, and stand up to heavy traffic.

"We experimented extensively with many grades of tar and chippings before we discovered the ideal blend. The surface we have decided on is much rougher than is usually used, but from our tests we are satisfied that it does not cause trouble to tires.



National Battery Reports

CHICAGO, Aug 18—A gain in net profits is reported for the National Battery Co. for the fiscal year ended June 30, 1931. Net earnings amount to $488,987 after all charges, equivalent to $14.80 a share on 33,023 $2.20 convertible preferred stock outstanding. This compares with $480,525 or $13.62 a share on 35,350 preferred stock outstanding for the preceding fiscal year. In issuing the figures, L. J. Shields, president, announced two contracts involving more than $20,000,000. One of these is a five year renewal beginning Jan. 1, 1932, with Montgomery Ward and Company and one with the Western Auto Supply Company for four years. In July battery sales totaled 80,000 units as against 73,000 in the same month of last year, and August, so far, shows a 10 per cent increase over a year ago.

Don Arrives in U. S.

NEW YORK, Aug. 17—Kaye Don, who hopes to take back to Great Britain the Harmsworth Trophy, held by Gar Wood since 1921, arrived in the United States yesterday on the White Star Liner Majestic. On arrival, he planned to leave for Montreal, where he will meet the "Miss England II," which was shipped to Canada in order to get it through to Detroit with a minimum of trouble. Don was accompanied here by Henry Martin, builder of the "Miss England II," and three mechanics.

Bendix Plans Use of Jobber Outlets

CHICAGO, Aug. 18—Announcement in the near future of new products by Bendix Aviation Corp. will give that company access to markets not heretofore enjoyed. Clutch control and Startix will be available to motorists through jobbers, while in the past all of Bendix articles have been sold directly to the manufacturers of automobiles and used as original equipment. The new products will be offered to manufacturers but can be installed on cars now on the streets at moderate prices. It is understood that the clutch control will be offered at between $20 and $30 installed. A new lubricating system reported to have been adopted by a leading oil concern will soon be announced by the company, it is understood.

De Soto Business Up

DETROIT, Aug. 17—The week ending July 18 was one of the eight largest weeks in the history of De Soto Motor Corp., and it was likewise the largest week since June, 1929, according to a statement today by L. G. Peed, general sales manager. Retail deliveries by De Soto dealers during the month of June were 50 per cent over the corresponding month last year, it was said.

Plan Foundry Exposition

An international foundry exposition will take place at Milan, Italy, September 12-27. It will be accompanied by an international congress under the auspices of the International Committee of Foundry Associations. In addition to raw materials the exposition will cover machines, tools and equipment for use in foundries and foundry products. There will also be included an educational exhibit and a section for the technical press. The office of the exhibition committee is located at 11 Via Verdi, Milan.

Oakland Plans Campaign

PONTIAC, MICH., Aug. 17—The Oakland Motor Car Co. will spend $500,000 in eight weeks' advertising campaign, beginning Aug. 21, it was announced at the factory today.

The campaign has been designed to serve as a backbone of a business drive which the company will sponsor during late August and September.

Chrysler Captures Belgian Road Race

DETROIT, Aug. 17—With a total mileage of 1499.7 miles in 24 hours, a Chrysler De Luxe Eight stock car captured first prize in the recent 24-hour Belgian road race in that country, according to word received by Chrysler Sales Corp.

Austin Sets New Class H Records

Equipped With Supercharger, Tiny Car Reaches 102.28 M. P. H.

LONDON, Aug. 9 (*by mail*)—In half a gale of wind and heavy rain a supercharged Austin Seven driven by Leon Cushman broke four international Class H records (for cars of 750 cc. and under) at Brooklands Track yesterday. The flying kilometer was covered at 102.28 m.p.h. and the flying mile at 100.67 m.p.h., these being the mean speeds of runs in two directions, as required by the international rules. The standing start kilometer was covered at 65.01 m.p.h. and the standing mile at 74.12 m.p.h.

The previous records for the flying mile and kilometer were made by G. E. T. Eyston on a supercharged M.G. Midget at 97.09 and 96.63 m.p.h.; Eyston beat the records put up by Sir Malcolm Campbell on an Austin Seven at Daytona in February last after his record-breaking runs on "Bluebird"; he averaged 94.031 m.p.h. for the mile and 93.964 m.p.h. for the kilometer. The M.G. Midget still holds the Class H records for 5 and 10 miles and 5 and 10 kilometers at higher speeds (101.86 to 103.13 m.p.h.), but these records, made also in February last, were run in one direction only.

Reports on Fuel Mixture

At a recent meeting of the National Office for Liquid Fuels in France it was brought out that it is impossible to prepare stable mixtures of gasoline and alcohol containing less than 20 per cent of alcohol, and it was decided to request the government to make obligatory the admixture of alcohol in the proportion of at least 20 per cent with all gasolines other than corresponding to the so-called "tourist" grade, steps being taken to assure that the alcohol be furnished by the government monopoly to the refiners at a price not higher than that of the gasoline with which it is to be mixed.

Hayes Reports Loss

GRAND RAPIDS, MICH., Aug. 18—Hayes Body Corp. has reported net loss of $70,101 after depreciation, taxes, etc., for quarter ended June 30, compared with net loss of $93,335 in the first quarter and a net loss of $279,073 in the corresponding quarter 1930.

Dodge Deliveries Increase

DETROIT, Aug. 17—The week ending August 1 showed an increase of 60.2 per cent in retail deliveries of Dodge Bros. passenger cars, truck, school buses and taxicabs, when compared to the same period in 1930.

Men of the Industry and What They Are Doing

Ross Mackinnon Resigns

An important change in personnel in the executive staff of General Motors Products of Canada is announced with the resignation of Ross Mackinnon, assistant general sales manager. C. E. McTavish, who will succeed him, has been with General Motors of Canada for 15 years, and the position he vacates is that of parts and service manager for all divisions. He is well known in western Canada as well as in the East, having spent seven years in Regina, three of which were as Western sales manager for Chevrolet. In 1919 he was transferred to Oshawa as Chevrolet service manager for Canada, and in 1921 was assistant general sales manager for Chevrolet. In 1924, following three years on central sales staff, he reorganized the parts and service departments across Canada on a zone basis. Succeeding C. E. McTavish as parts and service manager for Canada is R. N. Grainger.

Janeway Joins Chrysler

Robert N. Janeway, consulting engineer, has joined the engineering staff of the Chrysler Motor Corp., and will be associated with R. K. Lee, director of research. Mr. Janeway is the author of a comprehensive article on the Rapid Calculation of Bearing Loads which appeared in the May 30 and June 6 issues of *Automotive Industries*, and which attracted wide attention in automotive engineering circles.

R. K. Lee, with whom Mr. Janeway will be associated, sailed for Europe Aug. 14 on a combined business and pleasure trip to last a month.

L. A. Young Injured

L. A. Young, president, L. A. Young Spring & Wire Corp., was injured Aug. 14 when his automobile crashed into an abutment on Rochester Road, a short distance from Detroit. He was en route to his summer home at Wing Lake.

J. I. Case Names Clark

William L. Clark, former sales manager Moline Wagon Co., Samson Tractor Co., and manager of the Chicago division, Parker Fountain Pen Company, has been appointed sales manager of J. I. Case Co.

Oberhaensli Licenses Sold

NEW YORK, Aug. 20—According to a cable message, F. Oberhaensli & Cie. of Bregenz, Austria, have concluded license agreements with Etablissements Lyonnais Rochet-Schneider of Lyons, France, and with Tangyes Ltd., of Birmingham, England. An extension of the Oberhaensli license previously granted to the Vogtlaendische Maschinenfabrik, of Plauen, Germany, is also reported. The latter firm now has 40 engines of this design under construction for installation in its "Vomag" motor trucks.

The type of engine covered by the licenses was fully described in *Automotive Industries* of March 21 last and is adapted primarily for motor trucks and omnibuses. Its principal feature is an incandescent shell freely suspended within the completely water-cooled combustion chamber; the function of the shell is to intensify the heat of compression without actually raising the compression pressure and to produce turbulence in the compressed air displaced by the engine piston.

THE NEWS TRAILER

(Continued from page 289)

Chicago police department. The deal for the cars included a white sedan, to be used by Chicago's new "greeter," George Gaw. One of his first trips in the car was to see the twenty-millionth Ford when it called at the City Hall this week. * * * The second international patent exposition, which will open in the Chicago Merchandise Mart Sept. 14, will include models of everything from non-skid soap to a combination hydroplane, submarine and armored tank. A new type of spark plug, invented by a girl stenographer, is among the attractions, as is a two-way fly-swatter. * * * Approximately 85 per cent of the automobiles which have passed through Chicago's safety lanes have been found defective. Defective lights led all other faults, 49 per cent having that trouble; 30 per cent had bad brakes and 17 per cent poor wheel alignment.—H. H. *et al.*

Organize Lambert Aero Engine Concern

MOLINE, ILL., August—The Lambert Engine & Machine Co. has been incorporated with $25,000 capital by D. A. Luscombe, Sigmund Lunde and Roy Somerson to manufacture the Lambert aircraft engine for the Mono Aircraft Corp. and other airplane manufacturers.

The company will occupy a shop in the former Velie Motors Corp. building, vacated by Mono Aircraft, which is concentrating all activities in St. Louis.

Oil Engines Gain Use in England

London and Manchester Bus Operators Add to Fleets Using Heavy Fuel

LONDON, Aug. 7 *(by mail)*—The oil engine for bus use continues to exert increasing appeal in England, and, though it cannot yet be said to threaten completely to displace the gasoline type, it is worthy of note that some of the biggest bus operating companies think fit to increase their fleets of oil-engined chassis. Thus, this week the London General Omnibus Company has decided to increase its fleet of oil-engined buses from six to fifty, and has ordered the required number of engines to displace those of existing gasoline buses; the type adopted is the A.E.C. Acro, of which a full description appeared in *Automotive Industries* on December 13 last.

The Manchester Corp. bus department has just ordered 30 oil-engined chassis from Crossleys, after running experimental models since the early part of this year. Leyland is about to produce an oil-engined chassis, and other bus manufacturers have this type under test with the intention of having it ready for production at or before the opening of the truck and bus show at Olympia this year.

Gemmer Reports Profit

DETROIT, Aug. 17—Gemmer Manufacturing Co. has reported net earnings of $10,280 for six months ended June 30, 1931, after all charges and Federal taxes. This compares with profit of $270,834 for the same period last year.

Total current assets as of June 30, 1931, were $1,108,496 and current liabilities $95,581.

Assets

Cash on hand and in banks		$ 183,001.05
Certificates of Deposit		200,000.00
Notes Receivable		15,649.01
Accounts Receivable		158,382.69
Inventories		384,560.33
Corporation Insurance		27,657.84
Investments		139,245.04
Total Current Assets		$1,108,495.96
Fixed Assets	$2,691,572.83	
Less Reserve for Depreciation	675,472.43	2,016,100.40
Good Will and Patents		1.00
Prepaid Expenses		29,124.88
Unamortized Bond Issue Discount		4,274.83
Development		56,210.20
Municipal Bonds in Default with Interest		51,816.66
		$3,266,023.93

Liabilities

Accrued Salaries and Payroll	$ 10,833.16
Accounts Payable	67,028.32
Government Taxes Due in 1931	17,719.39
Total Current Liabilities	$ 95,580.87
Debenture Bonds	367,000.00
Capital Account: Net worth applicable to 40,000 shares of no par value participating preference stock and 100,000 shares of no par value common stock	2,803,443.06
	$3,266,023.93

Kliesrath Entry Wins Gold Cup

Second Consecutive Possession of Marine Trophy for Bendix Official

MONTAUK, L. I., Aug. 16—Rounding the guide buoys tightly and holding an even speed on the straightaway, Victor Kliesrath retained the Challenge Gold Cup of the American Power Boat Association on Lake Montauk today with an average speed of 53.59 m.p.h. He drove last year's winner, the Hotsy Totsy.

Mr. Kliesrath, who recently was appointed head of automotive engineering activities of the Bendix Aviation Corp., won last year's classic with an average speed of 52.286 m.p.h. The speed boat had been altered only slightly for this year's run.

The Hotsy Totsy and Miss Philadelphia, John J. Shibe's entry, were the only boats in the contest which did not encounter trouble sometime during the day.

Mr. Kliesrath won two of the three 30-mile heats, and second in the other. The veteran driver held his speeds down to just win, rather than attempting to break the lap record of 63.64444 m.p.h., established last year by Miss California. His fastest lap was 56.84.

The Hotsy Totsy rolled up 1161 points with two firsts and a second. Miss Philadelphia took 1122 points with two seconds and a first to gain runner-up honors, while the ill-fated Californian took third with 648 points. Scotty took fourth with 613 points, John Wanamaker, Jr.'s, Louisa fifth with 256 points and Gerald Holbrook's Red Banker sixth with 225 points.

Only two other boats were in the race. Horace E. Dodge's Miss Syndicate III "just would not go," Benny Hill, its driver, declared, while the other craft, George Reis's El Lagarto, sustained what was perhaps the most disappointing accident of the entire race.

It was El Lagarto that promised to give Hotsy Totsy a run for the cup. For ten laps of the first heat Reis drove his speed boat along in such a faultless style that at the ten-lap buoy it led the defending champion by almost a mile.

El Lagarto had less than four miles to go when a piston cracked and the steady hum of its motor stopped with disquieting suddenness. El Lagarto was through for the day and Hotsy Totsy swept ahead to finish the heat first and thus create a point lead that was never threatened.

American Power Boat Association Challenge Gold Cup Winners

Yr.	Boat	Owner	Hp.	Avg. Speed
1904	Standard	C. C. Riotte	..	23.6
1904	Vingt-et-Un II	W. S. Kilmer	75	25.3
1905	Chip	J. Wainwright	10¾	15.9
1906	Chip II	J. Wainwright	..	20.6
1907	Chip II	J. Wainwright	15	20.8
1908	Dixie II	E. J. Schroeder	220	30.9
1909	Dixie II	E. J. Schroeder	220	32.9
1910	Dixie III	F. K. Burnham	250	33.6
1911	Mit II	J. H. Hayden	100	36.1
1912	P.D.Q. II	A. G. Miles	80	36.8
1913	Ankle Deep	C. S. Mankowski	300	44.5
1914	Baby Speed Demon II	Paul Blackton	180	50.49
1915	Miss Detroit	M. Det. P.B.A.	250	48.5
1916	Miss Minneapolis	M. Minn. B.A.	250	49.7
1917	Miss Detroit	G. A. Wood	250	56.5
1918	Miss Detroit III	Det. Yachtsmen	400	52.1
1919	Miss Detroit III	G. A. Wood	400	56.3
1920	Miss America	G. A. Wood	900	70.0
1921	Miss America	G. A. Wood	900	56.5
1922	Packard Chris-Craft	J. G. Vincent	185	40.6
1923	Packard Chris-Craft	J. G. Vincent	200	44.4
1924	Baby Bootlegger	C. S. Bragg	240	46.4
1925	Baby Bootlegger	C. S. Bragg	240	46.4
1926	Greenwich Folly	G. H. Townsend	..	49.22
1927	Greenwich Folly	G. H. Townsend	..	48.65
1929	Imp	R. F. Hoyt	..	48.45
1930	Hotsy Totsy	V. Kliesrath	..	52.44

Summaries in 1931 Gold Cup Race

FIRST HEAT

Boat and Owner	Time	M.P.H.	Best Lap	Pts.
Hotsy Totsy, Victor Kliesrath	32:46.4	54.92	56.54	400
Miss Philadelphia, John Shibe	34:16.3	52.52	55.35	361
Californian, Richard Loynes	35:21.1	50.92	56.27	324
Scotty Too, Samuel B. Dunsford	35:39.5	50.48	53.69	289
Louisa, John Wanamaker, Jr.	37:32.1	47.96	55.31	256
Red Banker, Gerald C. Holbrook	42:20.0	42.52	44.67	225
El Lagarto, George Reis	D. N. F.	.....	56.57	...
Miss Syndicate III, Horace E. Dodge	D. N. F.	.....	.....	...

SECOND HEAT

Hotsy Totsy, Victor Kliesrath	33:20.5	53.99	56.84	400
Miss Philadelphia, John Shibe	34:02.1	58.89	56.27	361
Californian, Richard Loynes	T. N. T.	.....	49.70	324
Scotty Too, Samuel B. Dunsford	D. N. F.	.....	53.44	...
Louisa, John Wanamaker, Jr.	D. N. F.	.....	51.08	...
Red Banker, Gerald C. Holbrook	D. N. F.	.....	42.33	...
Miss Syndicate III, Horace E. Dodge	D. N. F.	.....	.....	...

THIRD HEAT

Miss Philadelphia, John Shibe	33:57.61	53.00	54.66	400
Hotsy Totsy, Victor Kliesrath	34:41.73	51.88	55.87	361
Scotty Too, Samuel B. Dunsford	34:50.86	51.65	52.52	324
Californian, Richard Loynes	D. N. F.	.....	.....	...

FINAL STANDING

Hotsy Totsy, first, 1161 points; Miss Philadelphia, second, 1122; Californian, third, 648; Scotty Too, fourth, 613; Louisa, fifth, 256; Red Banker, sixth, 225.

D. H. Torry

DETROIT, Aug. 20—D. H. Torry, sales manager, National Division, Federal Motor Truck Co., died yesterday of heart disease.

Asks Tax Suspension

DETROIT, Aug. 20—Chrysler Corp. has taken action against the city of Hamtramck to have payment of its 1931 taxes suspended pending an investigation and complete revaluation of all property in the city. The suit charges deliberate fraud and discrimination against Chrysler in the assessment of property in Hamtramck.

Graham Resumes

DETROIT, Aug. 18—After a two-week holiday, the Graham-Paige plant has resumed operations. Production schedules will be on the same basis, it is said, as before the vacation period. The factory was at that time working four days a week.

Buick to Close in Sept.

FLINT, Aug. 20—Buick Motor Car Co. will close certain departments for the first three weeks in September for annual inventory. According to C. W. Churchill, general sales manager, the plant will resume operations beginning the fourth week in September.

Some departments of the factory will continue work during inventory, it is understood.

Thermoid Reports Earnings

TRENTON, N. J., Aug. 20—Thermoid Co. has issued a financial statement showing earnings of $216,580 during the first half of the present year. The figures represent two and a half times the interest requirement, amounting to $2.21 per share on preferred stock. The figures are exclusive of the Southern Asbestos Co., a subsidiary, whose profits for the same period were $8,993, after depreciation had been deducted.

W. M. Cornelius

Richard Cornelius, 20-year-old son of Willard M. Cornelius, president of Parker Rust Proof Co., died Wednesday following an automobile accident in which Mr. Cornelius and another son, Willard, also were seriously hurt.

Aircraft Sales to Army and Navy Bolstered Industry's Output During First Half of '31

NEW YORK, Aug. 17 — Combined sales of military and commercial aircraft registered a slight gain in the first six months of 1931 as compared with the same period of 1930, according to a report on production just issued by the Aeronautical Chamber of Commerce.

Planes and engines valued at $19,618,043 were sold by the manufacturers in the first half of the current year. Sales of commercial craft declined sharply, but increased purchases of equipment by the army and navy raised the total to $85,703 above that for the first half of 1930. Deliveries in the first six months of last year totaled $19,532,340.

The valuation-of-product figures issued by the A.C.C. supplement the report on unit production released last week by the Aeronautics Branch of the Department of Commerce, which were printed on page 259 of *Automotive Industries*, issue of Aug. 15.

Commercial airplane and engine sales were off 34.6 per cent in the first six months of 1931, as contrasted with the same period last year. The value of the commercial equipment sold by manufacturers in the first half of the current year was $6,957,134. The figure for the first six months of 1930 was $10,628,748. Sales of military aircraft, on the other hand, showed a 57.8 per cent gain, as the services sought to bring their equipment up to the levels authorized by the five-year procurement programs now nearing a close. Planes and engines delivered to the military air services in the first six months of this year were valued at $12,660,909. Total sales of military equipment in the corresponding period of 1930 were but $8,903,592.

Production of commercial aircraft slumped even more than sales. In the first half of this year commercial airplane and engine production, from the dollar standpoint, dropped 42.9 per cent. The value of commercial planes and engines produced in the first six months of 1931 totaled $6,344,933, as compared with a total production value of $11,110,030 for the same period in 1930.

In the first half of 1930 the value of the military planes and engines manufactured totaled $8,125,566. The military equipment produced in the first six months of the current year was valued at $12,246,978, a rise of 49.3 per cent. The difference in the valuation of the equipment produced and that sold is accounted for by the fact that airplane and engine manufacturers are continuing to liquidate their surplus stocks.

Values of commercial airplanes, less engines, have dropped tremendously in the last year. One thousand, one hundred and sixty-two commercial planes were produced in the first six months of last year, while 982 were manufactured this year, a drop of 15.5 per cent. At the same time, the value of the commercial airplanes produced declined 45.5 per cent. The valuation of the commercial units produced in the first half of 1930 was $7,045,350; those produced this year, $3,844,391.

Unit sales of commercial airplanes reached a total of 1244 in the first half of 1930. These planes were valued at $6,690,575. Nine hundred and forty-one commercial craft, valued at $4,196,727, were delivered by the manufacturers to private individuals, industrial concerns, aerial service operators, and the transport lines in the first six months of this year. The drop in the number of units sold was 24.4 per cent, and the reduction in total value 37 per cent.

With regard to commercial aircraft engines, both the number of units produced and the number delivered this year exceeded the figures for the first six months of 1930, the former by 10 per cent, the latter by 14 per cent. This was due to the activity in the production of engines of low horsepower, which are being used to equip the new light planes for the private owner. The total value of the commercial power plants produced in the first half of 1931, however, dropped 38.5 per cent, as compared with last year, while the value of commercial engine deliveries was 30 per cent under that for the corresponding period in 1930.

Plans Air Race Event

CLEVELAND, Aug. 17—Assault on the world's record for land airplane speed was definitely scheduled for the 1931 National Air Races, Aug. 29 to Sept. 7, with the announcement by E. W. Cleveland, race contest chairman, that a 3-km. (1⅞ miles) straightaway course will be laid out in front of the air race grandstand.

Both men and women speed fliers will dive from the established limit of 1312 ft. to flash across the course in attempts to set new speed records.

The late Adjutant Bonnet of France holds the men's record, made at Istres, France—277.805 m.p.h. Lieutenant Alford J. Williams, former navy speedster, holds the American record at 266.59 m.p.h., established at Mineola, L. I., in 1923.

Willys July Sales Gained

TOLEDO, Aug. 17—Willys-Overland sales for July were 15.9 per cent better than in same month last year, L. A. Miller, president, reported today. Willys-Six continues to lead, with new low-priced Willys-Knight second.

McClaren On Full Time

CHARLOTTE, N. C., Aug. 17—Officials of the McClaren Rubber Co. here state that the tire manufacturing plant is maintaining a full-time production schedule.

Plan Restriction Of Tin Production

Producers Representing 92 Per Cent of World's Supply Agree to Plan

An International Tin Committee some months ago worked out a scheme for the reduction of the world's tin production in order to uphold prices. The agreement has now been subscribed to by Cornwall, Australia, Indo-China, Dutch East Indies, Bolivia, Nigeria and Siam, which represent more than 92 per cent of the world's total resources of tin. Siam was the latest producing country to sign the agreement, and the importance of this accession to the movement to control the production of tin is shown by a statement recently issued by the tin committee, according to which, of the then non-participating countries, Siam was the only one capable of increasing its production. That country produced 11,124 tons in 1929 and 13,000 tons in 1930. The effect of the participation of Siam is expected to be a reduction of 3000 tons in world production during the coming year. Of the other participating countries, Cornwall, Australia and Indo-China are said to have been compelled by the depression to cut production even more than the agreement provided for.

Tin is used in automobile production chiefly as a component of bearing bronzes, which are copper-tin alloys, and of solder, which is lead-tin alloy. It also enters into babbitt metal and is used as a base coating on steel when babbitt is to be applied directly to the steel by spinning. The automotive industry consumes more than 14 per cent of all the tin sold in this country.

Motor Wheel Reports Profit

NEW YORK, Aug. 17—Motor Wheel Corp. and subsidiaries report net profit for the first half of the current year of $211,131. This is equivalent to 25 cents a share on common stock, and compares with earnings of $980,607, or $1.15 a share, for the corresponding period of last year.

Earnings for the June quarter were $166,339, or 20 cents a share, as compared with $386,171, or 45 cents a share, for the corresponding quarter of last year.

Plan Show-Space Drawing

DETROIT, Aug. 17—Drawing for space at the Second Joint Trade Show of the National Standard Parts Association and the Motor & Equipment Association at Atlantic City, N. J., Dec. 7-12 inclusive, will be held at the Book-Cadillac Hotel, Detroit, on Sept. 17, according to an announcement issued by the two associations.

Change in Valuation of Automotive Stocks on the New York Exchange

(As of Aug. 1)*

Name of Group	Common Stocks: No. of Co.'s	Common Stocks: No. of Issues	Common Stocks: Average Price	Common Stocks: Total Mkt. Value	Preferred Stocks: No. of Issues	Preferred Stocks: Average Price	Preferred Stocks: Total Mkt. Value	All Stocks: No. of Issues	All Stocks: Average Price	All Stocks: Total Mkt. Value
Automobile & Truck Mfg. Co.'s (and Holding Co.'s)	23	23	$25.08	$2,099,729,893	7	$91.16	$216,775,157	30	$26.90	$2,316,505,050
Automobile Acces. Mfg. Co.'s (and Holding Co.'s)..	35	35	13.62	303,077,523	5	41.82	12,902,945	40	14.00	315,980,468
AUTOMOBILE INDUSTRY .....TOTAL	58	58	22.67	2,402,807,416	12	85.50	229,678,102	70	24.22	2,632,485,518
AIRPLANES-A'WAYS-A'PORTS ..... TOTAL	9	9	9.24	152,226,462	2	13.80	19,051,949	11	9.59	171,278,411
RUBBER TIRE & GOODS IND'Y.....TOTAL	8	8	13.86	133,321,296	10	50.62	134,948,485	18	21.84	268,269,781
FARM MACHINERY INDUSTRY.....TOTAL	7	6	28.10	227,248,306	5	52.24	164,007,575	11	34.85	391,255,881

* Bulletin of the New York Stock Exchange.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, Aug. 19—There was some improvement in wholesale and jobbing lines last week, while retail trade slowed down somewhat. Collections in the East were about as good as those a year ago, but they are still slow in the West and South.

EMPLOYMENT LEVEL

The Department of Labor reported that the level of employment in 15 major industrial groups during July was 2 per cent below that a year ago, while payroll totals were 4.8 per cent below.

CAR LOADINGS

Railway freight loadings during the week ended Aug. 1 totaled 757,293 cars, which marks an increase of 15,541 cars above those during the preceding week, but a decrease of 162,488 cars below those a year ago and a decrease of 348,627 cars below those two years ago.

COTTON CLOTH OUTPUT

Production of standard cotton cloth during July amounted to 192,545,000 yd., according to the Association of Cotton Textile Merchants of New York. Shipments were equivalent to 109.8 per cent, and new orders to 82.2 per cent of production respectively.

CRUDE OIL OUTPUT

Average daily crude oil production for the week ended Aug. 8 amounted to 2,555,550 bbl., as against 2,500,650 bbl. for the preceding week, and 2,480,350 bbl. a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended Aug. 15 stood at 69.5, as against 69.5 the week before, and 69.3 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended Aug. 12 were 18 per cent below those a year ago.

STOCK MARKET

The tone of the stock market last week was improved. Although there was a great deal of irregularity, the market received considerable support, and the trend of prices was upward. The volume of trading was on a larger scale.

BROKERS' LOANS

Brokers' loans in New York City during the week ended Aug. 12 declined $17,000,000, bringing the total down to $1,329,000,000, as against $3,155,000,000 a year earlier.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended Aug. 12 showed increases of $6,000,000 in holdings of discounted bills, of $70,000,000 in holdings of bills bought in the open market, and of $47,000,000 in holdings of government securities. The reserve ratio on Aug. 12 was 81.4 per cent, as against 83.9 per cent a week earlier, and 84.3 per cent two weeks earlier.

General Motors Corp.
Condensed Consolidated Balance Sheet
Six Months Ended June 30, 1931

Assets

Current Assets:	June 30, 1931	Dec. 31, 1930
Cash	$145,483,609	$145,713,657
United States Government securities	84,635,399	33,037,723
Other marketable securities	15,737,660	285,691
General Motors Management Corp. serial 6% debenture bonds, due March 15, 1932 (in 1930, due March 15, 1931)	7,000,000	7,000,000
Sight drafts with bills of lading attached, and c.o.d. items	9,856,407	6,707,616
Notes receivable	3,641,514	3,587,080
Accounts receivable and trade acceptances (less reserve for doubtful accounts: in 1931, $2,280,685; in 1930, $1,599,419)	34,696,277	28,965,096
Inventories	113,624,349	136,298,891
Prepaid expenses	2,417,588	3,221,742
TOTAL CURRENT ASSETS	$417,092,803	$364,817,496
Investments:		
Investments in subsidiary and affiliated companies not consolidated	$210,154,415	$207,750,253
General Motors Management Corp. serial 6% debenture bonds, due subsequent to one year	36,000,000	43,000,000
General Motors Corp. capital stocks held in treasury for corporate purposes (in 1931, 137,775 shares common; 11,117 shares $5 series no par preferred)	6,407,422	12,019,632
TOTAL INVESTMENTS	$252,561,837	$262,769,885
Fixed Assets:		
Real estate, plants, and equipment	$620,158,486	$614,030,329
Deferred expenses	15,994,361	22,246,234
Goodwill, patents, etc.	51,940,264	51,949,115
TOTAL FIXED ASSETS	$688,093,111	$688,225,678
TOTAL ASSETS	$1,357,747,751	$1,315,813,059

Liabilities, Reserves, and Capital

Current Liabilities:	June 30, 1931	Dec. 31, 1930
Accounts payable	$27,317,431	$26,975,871
Taxes, payrolls, and sundry accrued items	23,786,875	17,915,048
United States and foreign income taxes	19,726,255	17,013,276
Employees' savings funds, payable within one year	10,140,834	12,142,369
Contractural liability to General Motors Management Corp., due March 10, 1932 (in 1930, due March 10, 1931)	5,907,000	8,170,558
Accrued dividends on preferred capital stock	1,562,658	1,562,738
TOTAL CURRENT LIABILITIES	$88,441,053	$83,779,860
Reserves:		
Depreciation of real estate, plants, and equipment	$236,280,767	$218,656,021
Employees' investment fund	4,403,943	7,995,013
Employees' savings funds, payable subsequent to one year	35,527,094	32,326,509
Sundry and contingencies	7,813,376	5,809,981
TOTAL RESERVES	$284,025,180	$264,787,524
Capital Stock and Surplus:		
Capital stock of General Motors Corp.:		
Preferred, no par value (authorized, 6,000,000 shares; issued, 1,875,366 shares of $5 series)	$187,536,600	$187,536,600
Common, $10 par value (authorized, 75,000,000 shares; issued, 43,500,000 shares)	435,000,000	435,000,000
TOTAL CAPITAL STOCK	$622,536,600	$622,536,600
Interest of minority stockholders in subsidiary companies with respect to capital and surplus	2,552,428	443,800
Surplus	360,192,490	344,265,275
TOTAL CAPITAL STOCK AND SURPLUS	$985,281,518	$967,245,675
TOTAL LIABILITIES, RESERVES, AND CAPITAL	$1,357,747,751	$1,315,813,059

Foreign Motor Vehicles Stocks Reported by Cable

WASHINGTON, Aug. 18—According to cabled reports to the Automotive Division of the Department of Commerce, stocks of passenger cars in 35 foreign countries were estimated as follows:

Low-Priced	Amer.	Europ.
Low	6	3
Normal	22	15
High	6	10

Medium-Priced	Amer.	Europ.
Low	15	6
Normal	11	13
High	8	5

High-Priced	Amer.	Europ.
Low	13	7
Normal	10	11
High	6	3

Stocks could not be definitely classified in China, and no stocks were reported in certain groups. These omissions were due to the fact that there is no demand for some vehicles, as in the case of high-priced cars in the Gold Coast, or that sales of certain types of vehicles in some markets are negligible.

Used American car stocks showed up in the high categories in 14 countries, normal in 13 and low in 4. Similar figures for European cars were: high in 11, normal in 7, and low in 3.

	PASSENGER CARS						USED CARS		TRUCKS AND BUSES			
	Low Priced		Medium Priced		High Priced				Heavy Capacity		Light Capacity	
Country	U. S.	Other	U. S.	Other	U. S.	Other	U. S.	Other	U. S.	Other	U. S.	Other
Cuba	N	N	N	....	H	....	H	....	H	....	N	....
Porto Rico	UL	....	N	....	UL	....	....	....	None	....	H	....
Mexico	UL	....	UL	....	UL	....	L	....	L	....	UL	....
Panama	N	....	N	....	N	....	SH	....	N	....	N	....
Colombia	N	None	N	None	L	None	N	L	N	L	L	None
Peru	N	....	L	....	N	....	N	....	N	....	N	....
Argentina	H	N	N	H	H	N	N	N	N	N	N	N
Uruguay	N	L	L	UL	UL	UL	L	L	L	UL	L	UL
Finland	H	H	N	....	....	....	H	....	L	....	N	....
Sweden	N	....	H	....	N	....	N	....	SH	....	H	....
Netherlands	N	N	SH	L	H	N	N	L	N	N	N	N
Belgium	N	N	L	L	L	L	L	N	L	L	N	L
France	L	N	L	H	SH	UH	H	H	None	N	L	N
Germany	L	H	L	UH	H	H	N	H	None	UH	H	H
England	N	H	N	H	N	N	N	H	None	N	L	N
Portugal	N	H	L	L	UL	UL	H	H	L	L	N	H
Jugoslavia	N	H	L	N	N	N	H	H	N	N	N	N
Czechoslovakia	UL	SH	UL	SH	N	H	N	H	N	H	L	SH
Hungary	N	H	N	....	L	N	H	UH	....	N	N	N
Greece	N	N	SL	N	L	N	N	....	N	N	N	N
Poland	SH	UH	H	N	N	N	SH	UH	N	H	SH	UH
Rumania	N	N	SH	N	N	L	H	N	UL	N	N	N
Turkey	All automotive stocks unseasonably low.											
Egypt	N	N	L	L	L	L	N	H	L	L	N	L
Gold Coast	N	L	L	N	....	....	N	N	SH	....	N	....
Union of South Africa	N	N	L	N	UL	L	H	N	N	L	N	N
China	American automotive stocks 10 per cent higher than in June. Shanghai European stocks high.											
Philippine Islands	All automotive stocks reported normal.											
Japan	H	N	H	....	L	....	L	....	N	....	H	....
British Malaya	N	N	N	N	....	....	UH	H	N	L	N	N
India	N	N	N	N	N	N	H	H	H	N	N	N
Australia	UH	H	H	N	H	N	N	L	N	UL	H	L
Netherlands East Indies	N	N	H	N	L	....	H	....	L	L	H	L
Siam	N	H	L	N	None	None	N	N	H	None	UH	N
New Zealand	H	N	H	N	H	N	UH	N	N	N	N	L

NOTE: U—Unusually. S—Seasonally. ....—No information forwarded. H—High. L—Low. N—Normal.

The above information, based upon data obtained from the most reliable sources, is supplied by the foreign offices of the bureau. Every care is used in the preparation of the estimates, which are made only after careful investigation. "High" means that the supply is considered large in relation to current state of demand. "Normal" is used almost synonymously with "adequate," that is, when the volume on hand is sufficient to supply immediate requirements, plus the estimated demand for 1 to 1½ months. "Low" means that the volume on hand is not considered sufficient to supply immediate requirements.

Worthington Pump Buys Metalweld

HARRISON, N. J., Aug. 17—The Worthington Pump & Machinery Corp. has acquired the manufacturing and marketing facilities of Metalweld, Inc., Philadelphia, according to an announcement made here today. For a number of years the Metalweld organization has been building a line of portable compressor units, using Worthington pumps and marketing the complete unit under the name of Metalweld-Worthington. Manufacture of these units will be transferred to the Harrison plant at Worthington, and the Metalweld engineering and sales personnel will also be shifted.

Soviet Produces Aero Engine

According to the Economic Review of the Soviet Union, the first air-cooled airplane engine manufactured by the Soviets passed through a test satisfactorily on June 14 when a plane equipped with it made a non-stop flight from Kharkov to Moscow, a distance of 485 miles, in 4½ hr. The same issue of the Soviet organ announces that the production of the United Automobile & Tractor Industry increased by 133.7 per cent during the first half of the current year, as compared with the same period in 1930. This is greater than the rate of increase of any other Soviet industry.

Memphis Dealers Plan Show

MEMPHIS, Aug. 17—For several seasons the Memphis automobile dealers have not staged a show at the Mid-South Fair, but they will put on a show, Sept. 27 to Oct. 3, with 40,000 sq. ft. of space devoted to display of late models in passenger cars, trucks and buses.

G.M. Truck Sales Gain

PONTIAC, MICH., Aug. 17—Deliveries of General Motors Truck Co. for July were more than 32 per cent greater than June of this year, and nearly 16 per cent greater than July of last year.

May Standardize Horns

LONDON, Aug. 8 (*by mail*)—The Minister of Transport has appointed a committee to consider the practicability of evolving a standard motor horn for all automobiles used in England, one that should be effective as a warning signal and at the same time not so destructive to the nerves of the community as many of the horns now in use. The use of any kind of horn on a stationary vehicle was made illegal last year.

McAleer Reports Profit

DETROIT, Aug. 18—C. H. McAleer, president, McAleer Mfg. Co., has announced that the company's net profit for the first six months is practically equivalent to the year's dividend of $1.50 a share on 50,000 outstanding shares. An addition to the present factory is being planned and construction is expected to start this fall. The company also plans to take on the manufacture of other products to tie in with the present line.

Ohio Banks Close; Industry is Vigilant

Automotive Plants Help Protect Workers and Move to Protect Assets

TOLEDO, Aug. 18—Large automotive industries here will not be seriously hindered by the closing of three large banks and three smaller institutions in the last 48 hours.

Many directors of the Willys-Overland Co. are also directors of the Ohio Savings Bank and Trust Co., largest bank in Toledo, which failed to open Monday and some of the other large companies did business with the Commerce Guardian Trust and Savings Bank, which also did not open. These two, together with the Commercial Savings Bank and Trust Co., held more than $100,000,000 of assets.

Clement O. Miniger, president of the Electric Auto-Lite Co., with large personal holdings in each of the three big banks, has been working diligently in recent weeks to bring about a merger of them with infusion of more than $10,000,000 of new capital. With heavy demands facing these banks Monday and quiet withdrawal of checking funds, time was insufficient to arrange the merger and the banks closed for mutual protection of all.

Under Ohio law it will require probably several weeks to reopen. The Security Home Trust Co., third largest bank here which closed two months ago, has gone through the preliminary process and may be first to open.

Several automotive leaders met Monday and it was decided that plants will assist their employees during the suspension.

L. A. Miller, president of the Willys-Overland, said it would continue to operate three days a week with 7000 workers. The company has funds in many banks.

Automotive dealers are financed largely through the Industrial Bank or Morris plan bank, both special plan banks which are doing business as usual and large financing companies with outside capital and resources.

Toledo's four other commercial banks have successfully withstood a severe strain and are making every effort to expand their forces to care for the banking business of the city.

Several large oil companies operating strings of service stations opened accounts with the Toledo Trust Co. Monday and were doing business as usual.

Gasoline War Flourishes

CHICAGO, Aug. 18—The gasoline price war in Chicago has reached such extremes that station attendants are required to call their offices hourly to ascertain the quotation. Standard of Indiana, by cutting its prices two cents a gallon, precipitated the battle.

Stewart-Warner Corp. and Subsidiaries

Consolidated Balance Sheet—June 30, 1931

Assets

CURRENT ASSETS:			
Cash in Banks and on Hand		$ 3,086,847.57	
U. S. Government and Municipal Securities and Bankers' Acceptances		1,812,246.60	
Investments in Marketable Securities—valued at the lower of cost or market		654,414.30	
Accounts Receivable	$1,996,239.76		
Notes Receivable	376,439.52		
	$2,372,679.28		
Less—Reserve	370,917.58	2,001,761.70	
Inventories of Finished and Process Stocks, Raw Materials and Supplies—valued at the lower of cost or market		3,291,029.42	$10,846,299.59
EMPLOYEES' INSTALMENT ACCOUNTS RECEIVABLE:			
Due for Stock Purchases			131,446.97
DEFERRED CHARGES			316,483.11
CAPITAL ASSETS:			
Land, Buildings, Machinery and Equipment—			
At April 1, 1931		$23,783,092.81	
Deductions Since (net)		27,570.99	
		$23,755,521.82	
Deduct—Reserve for Depreciation—			
At April 1, 1931	$7,155,827.12		
Additions Since (net)	100,901.01	7,256,728.13	16,498,793.69
PATENTS, LICENSES, TRADE MARKS, TRADE NAMES AND GOODWILL			1.00
			$27,793,024.36

Liabilities

CURRENT LIABILITIES:			
Accounts Payable		$ 798,391.47	
Wages, Taxes Commissions, and Royalties Accrued		313,915.19	$ 1,112,306.66
PATENTS AND LICENSE PURCHASE MONEY OBLIGATIONS			205,000.00
CAPITAL STOCK:			
Authorized—2,000,000 shares of $10.00 each		$20,000,000.00	
Issued —1,295,882 shares of $10.00 each			12,958,820.00
EARNED SURPLUS:			
As per Statement below			13,516,897.70
			$27,793,024.36

Consolidated Income and Surplus Accounts for Three Months Ending June 30, 1931

GROSS PROFIT for three months ending June 30, 1931, after deducting all Manufacturing Expenses, exclusive of Depreciation			$ 1,322,443.29
Deduct—			
Selling Expenses		$ 655,065.34	
Administration and General Expenses—less Miscellaneous Income		309,112.48	
Provision for Depreciation		247,327.90	1,211,505.72
Net Profits and Income			$ 110,937.57
SURPLUS:			
At January 1, 1931		$14,022,823.53	
Deduct—Loss for three months ending March 31, 1931		331,756.73	
		$13,691,066.80	
Deduct—			
Patents and Licenses expenditures and Experimental and Development expenditures on New Lines	$265,518.46		
Additional Assessments of Taxes for prior years and others items	19,588.21	285,106.67	13,405,960.13
SURPLUS—June 30, 1931, per Balance Sheet			$13,516,897.70

Goodrich Reports Loss

AKRON, Aug 19—B. F. Goodrich Co. and subsidiaries report for six months ended June 30 net loss of $288,483 after depreciation, minority interest, etc., and after writing down raw material on hand and on commitment to the lower cost or market on June 30, last, comparing with net loss of $1,292,986 in first half of 1930.

Consolidated net sales in the six months ended June 30 were $59,878,000, compared with $78,007,291 in the like period of 1930.

In accordance with the usual mid-year practice of the company, the material content of semi-finished and finished goods was valued at cost.

The company states that second quarter operations showed a marked improvement compared with the first quarter of the year, while the current position is very satisfactory, with the current ratio being approximately 3.6 to 1.

Automotive Exports Drop 47.8 Per Cent

Belgium and Sweden Were Important Vehicle Markets in First Half

WASHINGTON, Aug. 18—Exports of all automotive products during the first half of 1931 had a valuation of $102,228,039, a decline of $93,799,523, or 47.8 per cent, from the half-year total of 1930, according to the Automotive Division, Bureau of Foreign and Domestic Commerce. This lowered figure represented reduced shipments in all classes of the automotive group since passenger cars declined $41,144,545, or 55.4 per cent, from the like period of 1930; trucks, $20,879,303, or 57.0 per cent; and miscellaneous products $31,775,675, or 37.3 per cent.

The domestic output of passenger cars and trucks for the period under review numbered 630,102 units, or 28.7 per cent, below the production total for the January-June period of last year. Shipments to our overseas markets, however, suffered a decline of 79,390 units, or 49.0 per cent. Passenger car exports fell off by 53,330 units, or 49.9 per cent, while trucks were 26,060 units, or 47.3 per cent, lower.

The monthly average for the first half of the years 1927-1931 is as follows: $36,893,851, $43,322,447, $58,738,949, $32,671,260 and $17,038,006. June exports of $11,364,057 were the lowest in years.

Due to changes in classifications it is not possible to compare exports of passenger cars and trucks with last year in all price and capacity groups, but in none of the comparable groups was an increase noted.

In the miscellaneous group but one item "automotive fire engines" had an improved total over 1930 figures.

Belgium and Sweden were the two leading countries of importance as purchasers of American motor vehicles, the former being the chief market for passenger cars, trucks and buses, and the latter purchasing the greatest number of motorcycles as well as ranking third and second in the car and truck list. Canada, which held first position last year as a market for passenger cars and motorcycles, now occupies second place in both groups. Japan advanced from eleventh position in the truck group to third place and from sixth to third market of importance for motorcycles.

Nash Invites Public to Ride

KENOSHA, WIS., Aug. 22—Several thousand new Nash cars will be placed at the disposal of motorists everywhere in the country during the first week in September as a feature of National "Guest Ride" Week, it was announced today by officials of the Nash Motors Co.

+ + CALENDAR + + OF COMING EVENTS

SHOWS

Olympia Passenger Car Show, London ..... Oct. 15-24
Olympia Truck Show, London..Nov. 5-14
Passenger Car Show, Glasgow..Nov. 13-21
Motorcycle Show, London..Nov. 30-Dec. 5

CONVENTIONS

S.A.E. Aeronautic Meeting (in conjunction with Natl. Air Races), Cleveland, Ohio ..... Sept. 1-3
Eastern States Exposition, Springfield, Mass. ..... Sept. 20-26
American Welding Society, Boston, Mass. ..... Sept. 21-25
American Electric Railway Assn., Atlantic City, N. J..... Sept. 26-Oct. 2
S.A.E. National Production Meeting, Detroit ..... Oct. 7-8
National Safety Council, Chicago, Ill. ..... Oct. 12-16
Society Industrial Engineers, Pittsburgh, Pa. ..... Oct. 14-16
Transportation Meeting, S.A.E., Washington, D. C. ..... Oct. 27-29
American Chemical Society, Buffalo, Aug. 31-Sept. 4
American Society Mechanical Engineers (General Meeting), Kansas City ..... Sept. 7-9
W. Va. Motor Transportation Assn., Charleston ..... Sept. 11
Society for Elec. Development, New York City ..... Sept. 11
Steel Founders Society, Chicago..Sept. 17
American Institute Mining and Metallurgical Engineers—Iron and Steel Division, Boston ..... Sept. 21-24
American Society for Steel Treating (National Metal Exposition), Boston ..... Sept. 21-25
American Society Mechanical Engineers—Machine Shop Practice, Boston ..... Sept. 21-26
American Gear Mfg. Assn., Pittsburgh ..... Oct. 15-17
National Hardware Assn., Chicago, Oct. 19-22
American Iron and Steel Institute, New York City ..... Oct. 23
American Railway Assn.—Motor Transport Division, Chicago..... Oct. 27-28
American Society Mechanical Engineers—Annual meeting, New York City ..... Nov. 30-Dec. 4
American Roadbuilders Association, Detroit, Mich. ..... Jan. 11-14, 1932

Forms New Company

ST. LOUIS, Aug. 17—Tiffany Castings Co., Inc., has been incorporated as a successor of Tiffany Aluminum Products Co., Inc. The new concern was organized by a group of Chicago financiers, to whom the former company was sold at auction by the trustee in bankruptcy on June 16 of this year.

Gets Ford Drill Order

SPRINGFIELD, MASS., Aug. 18—Baush Machine Tool Co. has received an order for 14 vertical multiple-spindle drilling machines from the Ford Motor Co. Preliminary work is being rushed and production will be put on a day-and-night schedule to complete the work in conformance to urgent demands.

Steel Operations Change Slightly

Flat Rolled Items Had Output Gain of 30,000 Tons in July

NEW YORK, Aug. 20—The last fortnight before the generally-looked-for quickening of the steel market's pace finds the rate of operations at finishing mills very little changed from what it was during the first half of August. According to the latest report of the National Association of Flat Rolled Steel Manufacturers, production in July showed a gain of nearly 30,000 tons and shipments were approximately 22,000 tons more than in the preceding month while fresh sales declined about 20,000 tons.

Tonnage of unsold stock was virtually the same at the end of July as at the end of June and approximately 6 per cent lower than at the end of July, 1930. Unfilled tonnage on the books of flat rolled steel manufacturers at the beginning of this month was sufficient to carry them through August at an operating rate of 53.8 per cent of capacity. What little business in sheets is being booked is at full prices. It is not sufficiently representative to justify the assumption that recent advances have met with final acceptance.

Strip steel producers are living in hopes of an early revival of automotive demand, present operations being estimated in some quarters at not more than 25 per cent of normal. Demand for cold-finished and alloy steel bars is very light.

Pig Iron—The market continues to mark time, nothing but single carload lots moving, and interest in fourth-quarter contracts being in abeyance.

Aluminum—Dissolution of the International (European) Aluminum Cartel is forecast in consular reports to the Department of Commerce. Price-cutting, especially in sales to the Soviet, is at the bottom of the difficulties. The market here is unchanged.

Copper—Steady. Sales slightly better. The market appears to have settled on a 7⅛ cents, delivered Connecticut Valley, basis for the time being.

Tin—Prompt Straits tin was offered at 26 cents at the beginning of the week, the market after several upward spurts having relapsed into mid-summer dullness.

Lead—Fairly steady amid moderate demand.

Zinc—Easy and quiet.

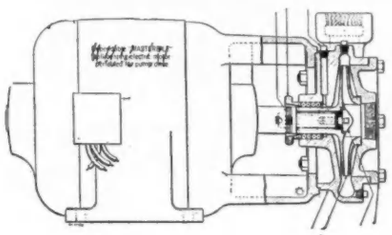
Michigan Payrolls Down

DETROIT, Aug. 17—Employment in the automobile industry as of July 15, according to a report by the Michigan State Department of Labor and Industry, totaled 159,176 as compared with 178,954 in June and 202,312 in July, 1930, based on the reports of 71 companies. The aggregate weekly payroll was $3,592,311 as against $5,046,099 for June and $6,008,006 for July last year. Average weekly earnings per capita were $22.57 for July, $28.20 for June and $29.70 for July, 1930, beyond which no figures are available for comparison, it is believed.

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

Worthington Monobloc Pumping Unit

TO fill the need for a centrifugal pump of good efficiency, low initial cost and low maintenance expense—the Monobloc (Type D) Centrifugal unit was recently placed on the market



by the Worthington Pump & Machinery Corp., Harrison, N. J. It is bolted to the extended motor frame and the impeller is mounted on the end of the continuous motor shaft. The bronze impeller incorporates the shaft sleeve as an integral part, this construction being one of Worthington's latest shaft protection developments. The special cadmium-plated steel locking device for the impeller; the forged bronze packing gland, and the arrangement of shaft water-throwers, are other important features of this pump. The ball bearing Masterbilt motor incorporates standard electrical construction.

New Belden Oil-Resistant Ignition Cable

AN ignition cable specially developed to resist oil and wear due to excessive vibration has been announced by the Belden Mfg. Co., 4689 West Van Buren Street, Chicago.

Tinned copper wire (19x27) is embedded in a specially developed orange rubber-insulated core. A cotton braid is applied which is impregnated with Beldenlac aircraft standard lacquer.

At this point the cable is the same as the regular Beldenlac aircraft standard ignition cable. Over this is wound varnished cambric tape. A cotton braid over the tape is coated with Beldenlac aircraft standard lacquer. Thus the new cable has three protective layers besides the usual insulating core, braid and lacquer.

This cable (referred to as No. 7781) is recommended for use on trucks and buses that are in continuous use, as well as on airplanes.

Dioxidyne Feed System

A NEW fuel feed system making use of the pressure of gases of combustion trapped at one of the cylinders, has been placed on the market by the American Dioxidyne Corp. of Pittsburgh. A diagrammatic representation of the system is shown herewith. The chief advantage claimed for the system is that it tends to prevent trouble from vapor lock in the fuel line.

In operation, a small portion of the products of combustion is trapped under pressure, and water vapor and unburned fuel in the trapped gas are condensed in the conveyor tube and blown off at the spring-loaded pressure-regulating and separating valve. Inert gas, i. e., carbon dioxide plus nitrogen, plus a small percentage of carbon monoxide and marsh gas under any predetermined pressure, forces the fuel into the accumulator tank and the carburetor float chamber.

After the fuel-tank cap is removed for refilling purposes, the engine operates on the fuel accumulated in the fuel supply tank, until the normal operation of the Dioxidyne System restores pressure on the main tank, whereupon the auxiliary tank is refilled and fuel fed directly to the carburetor.

The Dioxidyne system eliminates oxygen from the fuel tanks and the possibility of tank explosions by combustion of the contents. Analysis of the gas in the main fuel tank by Prof. Saylor at the Carnegie Institute of Technology, indicated 85 per cent inert gas and 15 per cent fuel vapor. At 75 lb. per sq. in. gage pressure, one volume of gasoline dissolves or absorbs approximately 50 volumes of carbon dioxide, and when the pressure is reduced it releases the carbon dioxide instantly. A 17 per cent carbon dioxide concentration in air will prevent combustion, indicating 300 volumes of inert or slow combustion per volume of liquid gasoline.

It is stated that each pound pressure applied to the main fuel tank raises the critical vapor-lock temperature approximately 6 deg. Fahr. Allowing for one pound negative pressure on the suction side of a pump, 12 deg. Fahr. average increase in fuel temperature in the pump, and five pounds positive pressure on the main fuel tank, the critical vapor-lock temperature is raised approximately 48 deg. Fahr., or sufficient to retain the fuel in liquid form under extraordinarily high fuel line temperatures.

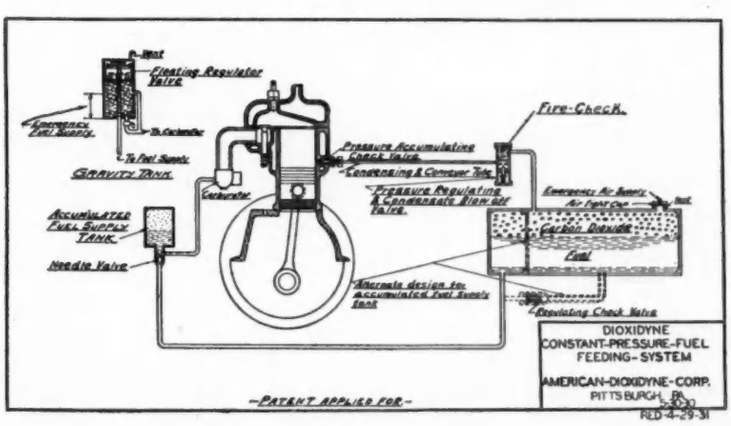
Prest-O-Weld Cutting Apparatus

THE Linde Air Products Co., New York, has added a cutting blowpipe and cutting attachment to its new line of Prest-O-Weld medium-pressure apparatus of the detachable valve body design. This apparatus includes the Type C-105 cutting blowpipe and the Type CW-105 cutting attachment.

These, together with the Types W-105 and W-106 welding blowpipes previously announced, can all be used interchangeably with the same detachable valve body. By means of the detachable valve body, the operator can change easily and quickly from a full size welding blowpipe to a smaller welding blowpipe, to a full size cutting blowpipe, or to a cutting attachment without detaching the hose or hose connections and without the use of a wrench.

The locking device for connecting the detachable valve body to any one of these blowpipe handles consists of a locking bolt and wedge-shaped locking screw. The locking screw is operated by turning a ring and draws the detachable valve body and blowpipe handle together, making a gas-tight joint.

(Turn to page 300, please)



NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Welding Torch and Cutting Attachment

THE Linde Air Products Co., New York, N. Y., has made two additions to its line of Purox medium pressure apparatus for oxy-acetylene welding and cutting. The Purox No. 11 welding torch, which supersedes the Purox No. 10 torch, has a wide welding range extending from the lightest sheet metal up to work as heavy as ½-in.

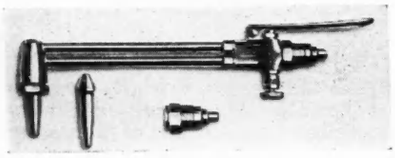
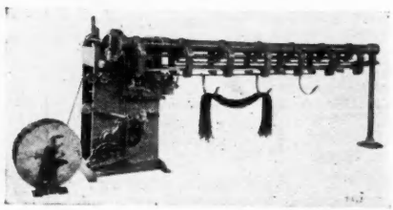


plate. In spite of this wide range the torch is light in weight and has perfect balance. The tips are of one-piece, hard-drawn copper so designed that the head angle can be easily adjusted.

The Purox No. 21 cutting attachment designed for use with the Purox No. 11 welding torch will cut metal up to 2 in. in thickness. It is furnished with one and two-piece Purox cutting tips. By means of this cutting attachment the welding torch can be easily and quickly converted into a cutting torch. This is one of the lightest cutting attachments on the market, weighing only 1 lb. 8 oz.

Artos Combination Machine

A HIGH-PRODUCTION combination measuring, cutting and stripping machine for long length cords and wires has been developed by the Artos Engineering Co., Milwaukee, Wis. The machine is adjustable for

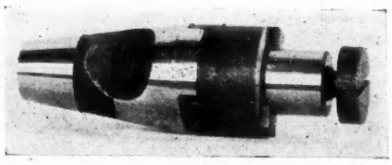


any length from 12 in. minimum to 20 ft. maximum. Stripping length is adjustable from ¼ up to 2 in. on either end. Production capacity is 1800 pieces per hour for lengths from 12 in. to 10 ft. and 900 pieces per hour for lengths from 10 ft. to 20 ft. It will handle single-conductor wires, two-conductor heater cords, parallel conductor lamp cords and multiple-conductor service cords. On heater cords and lamp cords an attachment can be used whereby the outer braiding is removed from the cord a certain predetermined distance back from the stripped conductors.

B. & S. Cutter Adapters

THE Brown & Sharpe Mfg. Co. of Providence, R. I., has recently announced some new cutter adapters, and spiral two-lipped end mills, arbors for shell end mills and screw arbors for use with these adapters.

The adapters are furnished in two different styles for use with milling machine having standardized spindle end, and, also, in one style for use on milling machines having Taper or Threaded-Nose Spindle. The Adapters are furnished with a milling machine standard taper hole into which the shank of the end mill or arbor fits.

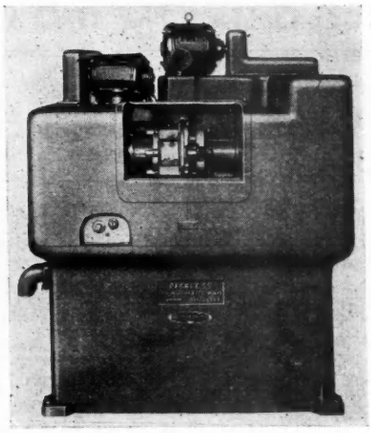


The end mill or arbor is held securely to its seat by a cam furnishing a positive drive. The surface of the cam engages the flat surface of the groove in shank of cutter. When the cam is turned to release it, the cutter or arbor drops from the adapter, the steep taper preventing sticking and insuring quick release.

Peerless Burring Machine

CITY MACHINE & TOOL WORKS, Dayton, Ohio, recently developed a Peerless No. 3 Special burring machine illustrated here. The particular application shown is for removing the burr in chamfering an automotive steering gear sector. Although this part has only two teeth, the machine can be arranged to handle three or four teeth equally satisfactorily.

Now done automatically on this new Peerless, at the rate of about 460 per hour, this was previously a slow, tedious, expensive hand filing opera-



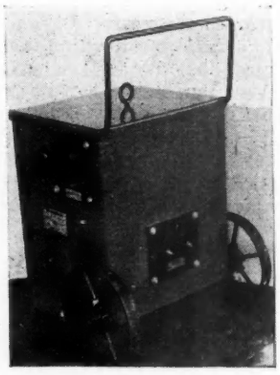
tion. This new method offers not only economy, but also uniformity.

This machine utilizes a continuous but variable speed rotation of turret, and after set-up, the operation resolves itself into a matter of loading and unloading the parts into the turret fixture.

Westinghouse Flex Arc Welder

AN A.C. arc-welding set designed for operation at between 8.5 and 125 amperes has been added by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This welder meets the demand for the economical arc welding of thin gage material in aircraft fabrication work.

The Flex-Arc A.C. welder may be used in conjunction with either bare or coated electrodes from 1/32-in. to ⅛-in. diameter. Many of the ferrous alloy materials commonly used with re-



versed-polarity direct current are effectively and easily applied in conjunction with this welder. It has also proved highly successful in the welding of aluminum.

(Turn to page 302, please)

A good job gets a great big hand...

J. R. CALDWELL
AKRON-DETROIT MOTOR FREIGHT

Ship by Truck

DETROIT, MICHIGAN

Budd Wheel Company,
Detroit, Michigan.

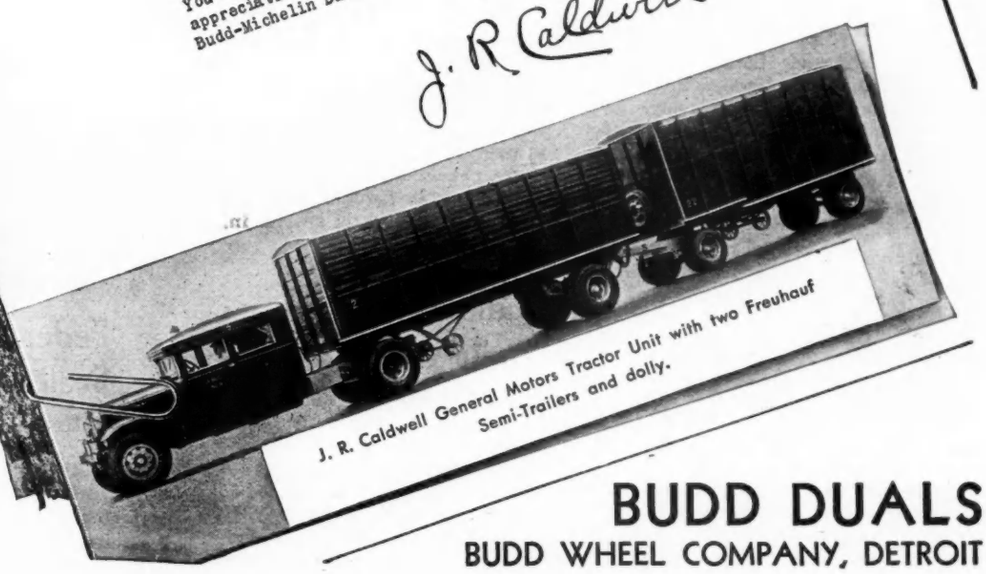
Gentlemen:

In the operation of our thirty odd units of equipment, we find it is more necessary now than ever before to "take-off" on time, grind through the miles at a minimum cost per pound and deliver to the customer on schedule time.

We feel that Budd's separate locking of each of the rear wheels - wheels that are demountable at the hub instead of the demountable rim type - are big contributions to the demands of modern truckmen for easy changes, longer tire mileage and appearance. You have done a good job and we have expressed our appreciation by equipping every Caldwell unit with Budd-Michelin Duals.

Yours very truly,

J. R Caldwell



J. R. Caldwell General Motors Tractor Unit with two Freuhauf Semi-Trailers and dolly.

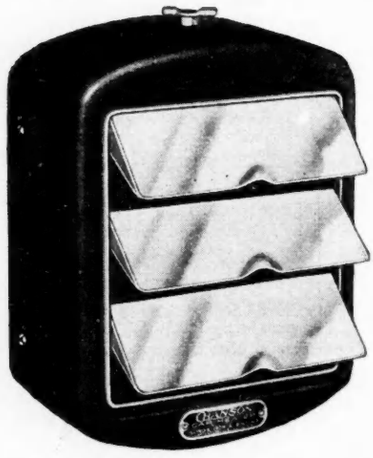
BUDD DUALS
BUDD WHEEL COMPANY, DETROIT

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Hot Water Heater for Automobiles

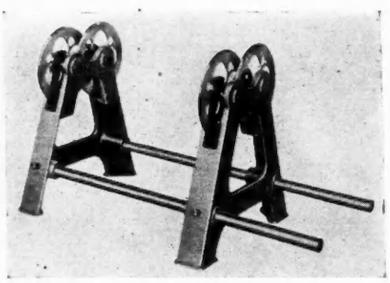
A NEW hot-water heater for automobiles, brought out by Chanson Division, Illinois Iron and Bolt Co., Carpentersville, Ill., is provided with an adjustable swinging bracket which permits the heater (mounted on the



dashboard) to be swung to the right or left so the current of heated air can be thrown in any direction. The heater is held in the position to which it is swung by a spring-operated friction joint.

Sundstrand Super-Sensitive Balance

THE Sundstrand Machine Tool Co., Rockford, Ill., has added to its line of balancing tools a super-sensitive tool for balancing light parts such as aluminum fans, motor armatures, etc.



The balanced knife-edge steel disks are mounted on hardened steel spindles which revolve on steel balls enclosed in hardened and ground races. This construction is said to be unusually sensitive because the spindle has a direct pivoting action on the ball bearings. The equipment is portable and does not require leveling, hence the tool can be placed wherever it is most convenient.

The manufacturer claims that the tool is so sensitive that a 1½-lb. disk can be thrown out of balance with a 5-grain weight on a 3-in. radius. The tool has a swing of 22 in.; a maximum distance between standards of 20 in.; a capacity of 12 lb. and a weight of 20 lb.

Ingersoll-Rand Multi-Vane Grinder

ANOTHER "Multi - Vane" type grinder and sander size 4F has been added to the Ingersoll-Rand line. This is a lightweight, high-production machine for grinding, sanding, polishing, and wire brushing operations. It is powerful, smooth running and correctly balanced. It can be fitted with a grinding wheel, sanding head, or wire brush. Among its uses are sanding and polishing automobile bodies, smoothing down welds, cleaning and surfacing large castings for painting, dies and other metal and wood surfaces and wire brushing.

The tool has two handles so that the operator can readily hold it at right angles to the working surface. One of the handles may be removed to facilitate working in close quarters. The second handle acts as the air inlet and contains a thumb-controlled throttle valve.

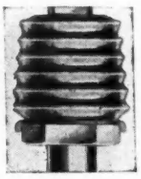
The standard free speed is 4600 r.p.m., but units can be furnished for higher or lower speeds. Overspeed is prevented by a governor.

Weight is 10¾ lb. without the adjustable guard for grinding wheels. Overall length, bare, is 9¼ in.

Ludlow Multi-Valve

MULTI-STAGE reduction of pressure and tight closure for air, steam, gas, water and viscous liquids are said to be afforded by the Ludlow Multi-Valve, just announced by the Ludlow Valve Mfg. Co., Troy, N. Y.

The heart of this valve is the multi-stage plug or cone. This cone is cor-



rugated with specially curved grooves in the side, forming a number of contact lands that seat against the converging wall of the outlet.

These grooves form annular expansion chambers, the area of each increasing with the circumference of the cone, thus reducing the density of the fluid step by step and forming separate back-pressure pockets which retard the flow.

The stainless steel cone swivels on the stainless steel stem. As long as its beaded lands are in contact with the converging walls of the seat, the cone cannot revolve, but once free from the seat it rotates with the spindle. In this way the cone continually corrects any possible leakage by presenting a new sealing surface for contact with each successive seating.

Thermoid Brake Blocks

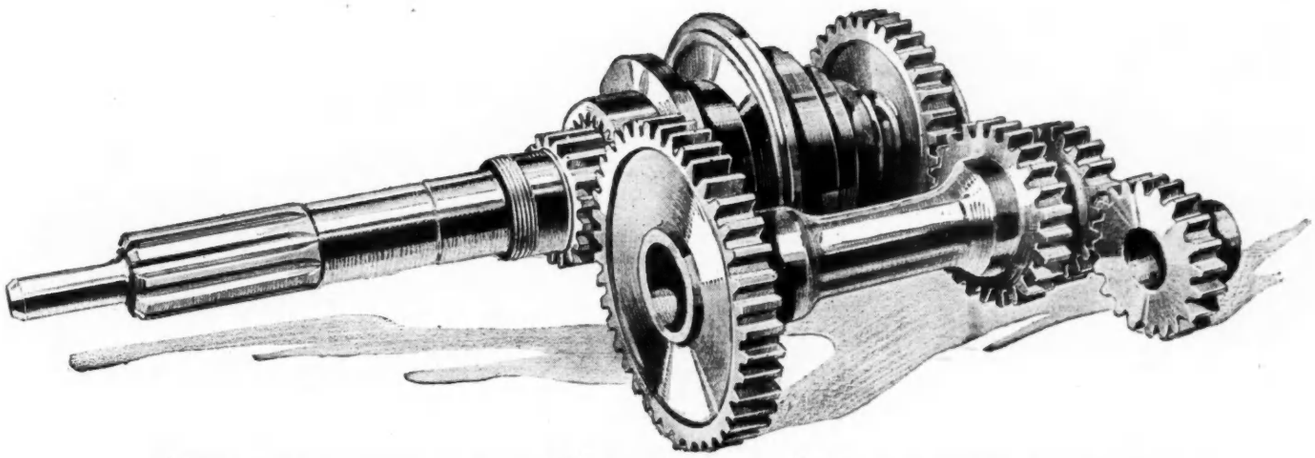
THE Thermoid Rubber Co., Trenton, N. J., announces that it has placed on the market a new type of brake block specially designed for use on high-speed trucks and buses. This brake material is said to withstand the high temperatures produced in the brake

lining of vehicles of this class without having its coefficient of friction lowered. These brake blocks are of the full-coverage type; they are wire reenforced throughout their entire thickness and are said to wear down evenly throughout their useful life.

Federal Grease-Sealed Bearing

THE Federal Bearings Co., Inc., Poughkeepsie, New York, have recently perfected the Federal vacuum-seal bearing, an all-metal bearing which does not depend upon felt, leather, cork or other materials as a

(Turn to page 304, please)



QUIETING GEAR ASSEMBLIES

on a Commercial Basis is Impossible Without: ★ ★ ★ ★ ★ ★

YOUR control of the duplication of a satisfactory tooth shape, and the perfection of the involute contacting surfaces, is virtually a matter of cutter perfection.

Gears finished on the Gear Shaper with Original Fellows Gear Shaper Cutters, and then kept under control in hardening, unquestionably can be produced at the lowest possible cost.

You should also appreciate that Fellows Cutter production methods are under positive CONTROL, with machines, processes, and inspection methods in every case based on fundamental principles in gear tooth generation. Because that CONTROL is exact to a degree that cannot be attained outside of Fellows Methods, Original Fellows Gear Shaper Cutters are your best insurance of economical gear production.

Let a Fellows Engineer counsel with you in analyzing your gear production costs, and the possible improvement of your product. No obligation, of course. THE FELLOWS GEAR SHAPER COMPANY, Springfield, Vermont. (616 Fisher Building, Detroit, Michigan.)

1. GOOD BLANKS

2. FELLOWS FINISHING

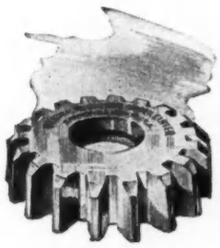
3. SUCCESSFUL HARDENING—

* * * You Must Have

CONTROL

at every Stage * * *

as with ORIGINAL FELLOWS GEAR SHAPER CUTTERS



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FELLOWS
~ GEAR SHAPERS ~

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

sealing agent. Some of the features of the new bearing are as follows:

No frictional contact between rotating parts. Free running without any drag. Efficiency of seal is mechanical. The inner impeller and outer seal form a vacuum pocket, preventing suction of foreign matter into the bearing. The impeller continually throws grease into the races and on to the balls where it is required, and the vacuum retains the grease. Impeller is securely pressed on inner bearing ring; outer seal is spun into recess in outer race ring.

Beaver Portable Pipe Machine

THE Beaver Model A pipe machine, a portable unit for cutting, threading and reaming ½ to 2 in. pipe steel, wrought iron, brass or cast iron, has been placed on the market by the Borden Co., Warren, Ohio.

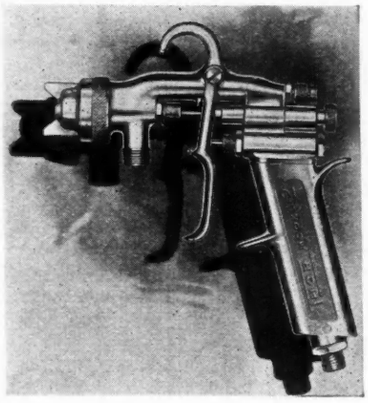
Three opening die heads are supplied (½ x ¾ in., 1 x 1¼ in., and 1½ x 2 in.) Dies are adjustable for over, under or standard. It is not necessary to back off over finished threads—a feature which insures great economy in operating time and die replacement. The cut-off follows the design of the patented Beaver square-end pipe cutter. The die head can be tilted back out of the way when cutting and

threading up to 12 in., using a universal shaft and geared die stocks and pipe cutters.

It has a ½-hp. universal motor, reversible at the switch; connected with flexible coupling; operates on 110 volts. Net weight 330 lb.

Thor Spray Gun

THE Binks Manufacturing Co., Chicago, Ill., has brought out the Thor Model 2, spray painting and finishing gun for spraying any material on any surface. This gun comes in two models, both identical except that on one the spray adjustment is made by a removable key, and on the other by a stationary control. A turn of the stationary control screw on the back



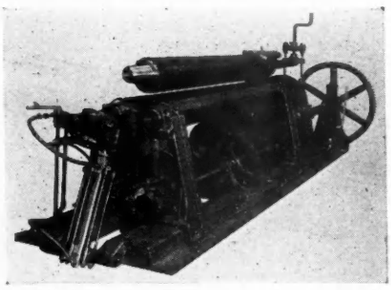
changes the spray from round to fan or fan to round without stopping spraying operations or adjusting nozzles.

The construction of the Thor gun includes a drop-forged body having a tensile strength of 62,000 lb. per sq. in. The handle is die cast, the fluid nozzle is built of special stainless steel, and the needle valve stem of special hardened stainless alloy steel.

Pyramid Type Bending Roll

THE pyramid-type bending roll shown here was developed by the Cleveland Punch & Shear Works Co., Cleveland, Ohio, to meet the demand for rolling small-diameter cylinders of heavy material. The photograph shows a shell rolled to an 8-in. diameter, using a slightly smaller diameter top roll. The rolling of the shell so close to the diameter of the top roll was obtained only by the correct relation of the center distance to the diameters of the rolls. After the cylinder was formed a test was made by laying a straight edge along the cylinder, and this showed but a fractional deflection which was less than 1/32 in. at any point along the entire length of the cylinder.

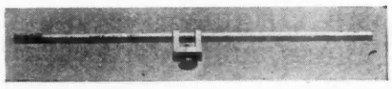
Some of the additional features incorporated in this roll include an air-operated drop hinge to allow the cyl-



inder to be removed from the roll, individual motor drive for operating the rolls and for raising and lowering the top roll.

Height Gage Attachment

THE Brown & Sharpe Manufacturing Co., Providence, R. I., has added depth-gage attachments Nos. 585A and 585B for use with Vernier height gages No. 585 in both the 10-in. and 18-in. heights. The attachment is



easily locked in place on the Vernier by means of a clamp screw. The application of the attachment to the Vernier height gage converts this tool into an accurate depth gage. Measurements can be taken accurately over high projections and in deep recesses —a very desirable feature.

Felt-Protected Ball Bearing

NORMA-HOFFMANN BEARING CORP., Stamford, Conn., announces a new 7000 series of felt-protected, closed-type ball bearings. The new unit is an all-steel, lubricant-packed, dirt-and-moisture-proof bearing, for which it is claimed that it permits of greater economy in installation.

The "Greaseal" feature consists of a substantial felt washer and a thin fiber ring interposed between split snap rings, held in a groove in the outer ring. The inner ring is recessed to present a shoulder which, with the felt washer, forms a labyrinth as an added safeguard against escape of lubricant. Ample space for grease reduces the attention needed for proper lubrication. The 7000 precision ball bearing is made in a full range of sizes, and interchanges in overall dimensions with other makes of self-protected bearings.